

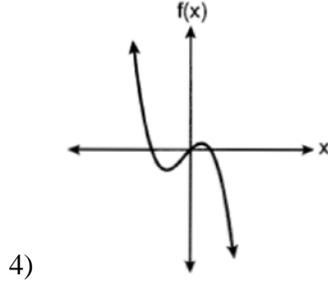
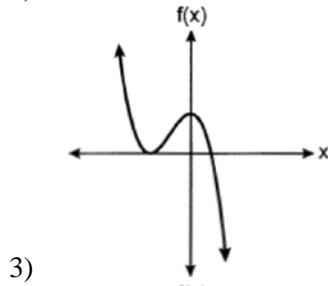
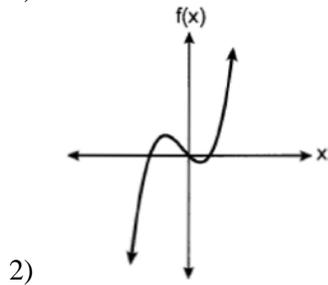
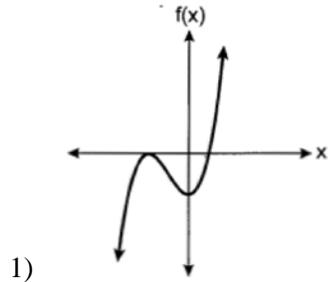
# JMAP REGENTS BY TYPE

The NY Algebra II Regents Exams Questions  
from Spring 2015 to January 2025 Sorted by Type

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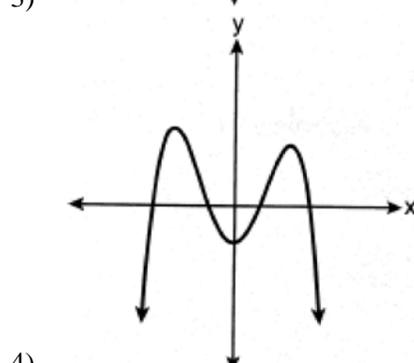
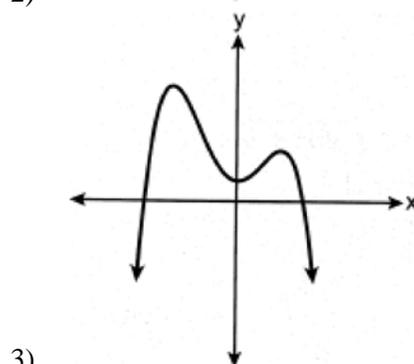
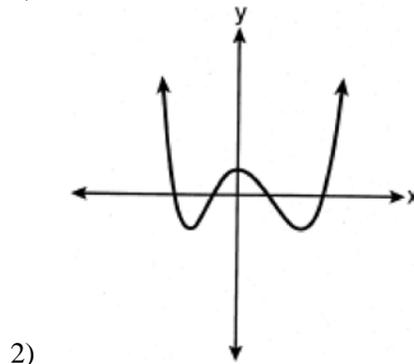
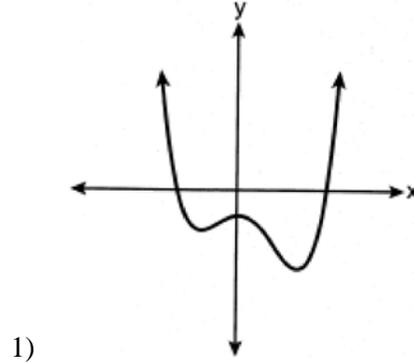
**Algebra II Multiple Choice Regents Exam Questions**

- 1 Which graph best represents the graph of  $f(x) = (x+a)^2(x-b)$ , where  $a$  and  $b$  are positive real numbers?



- 2 For  $f(x) = \cos x$ , which statement is true?
- 1)  $2f(x)$  and  $f(2x)$  are even functions.
  - 2)  $f(2x)$  and  $f(x) + 2$  are odd functions.
  - 3)  $2f(x)$  and  $f\left(x + \frac{\pi}{2}\right)$  are odd functions.
  - 4)  $f(x) + 2$  is an odd function and  $f\left(x + \frac{\pi}{2}\right)$  is an even function.

- 3 Which graph could represent a 4th degree polynomial function with a positive leading coefficient, 2 real zeros, and 2 imaginary zeros?





Algebra II Multiple Choice Regents Exam Questions

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- 11 A random sample of 152 students was surveyed on a particular day about how they got to school. The survey results are summarized in the table below.

|      | Attendance Status |         |
|------|-------------------|---------|
|      | Late              | On-Time |
| Car  | 6                 | 24      |
| Bus  | 20                | 80      |
| Walk | 4                 | 18      |

Which statement is best supported by the data?

- 1) The probability of being late given that a student walked is greater than the probability that a student walked given that the student was late.
- 2) The probability of being late given that a student walked is less than the probability that a student walked given that the student was late.
- 3) The probability of being late given that a student walked is equal to the probability that a student walked given that the student was late.
- 4) The probability of being late given that a student walked cannot be determined.
- 12 The heights of the 3300 students at Oceanview High School are approximately normally distributed with a mean of 65.5 inches and a standard deviation of 2.9 inches. The number of students at Oceanview who are between 64 and 68 inches tall is closest to
- 1) 1660
- 2) 1070
- 3) 2244
- 4) 1640
- 13 For all real values of  $x$ , if  $f(x) = (x - 3)^2$  and  $g(x) = (x + 3)^2$ , what is  $f(x) - g(x)$ ?
- 1)  $-18$
- 2)  $0$
- 3)  $-12x$
- 4)  $2x^2 - 12x - 18$
- 14 The seventh term of the geometric sequence  $\sqrt{6}, -2\sqrt{3}, 2\sqrt{6}, -4\sqrt{3}, \dots$  is
- 1)  $6\sqrt{6}$
- 2)  $-6\sqrt{3}$
- 3)  $8\sqrt{6}$
- 4)  $-8\sqrt{3}$
- 15 A recursive formula for the sequence  $40, 30, 22.5, \dots$  is
- 1)  $g_n = 40\left(\frac{3}{4}\right)^n$
- 2)  $g_1 = 40$   
 $g_n = g_{n-1} - 10$
- 3)  $g_n = 40\left(\frac{3}{4}\right)^{n-1}$
- 4)  $g_1 = 40$   
 $g_n = \frac{3}{4}g_{n-1}$
- 16 The equation of the parabola that has its focus at the point  $(-3, 2)$  and directrix at  $y = 0$  is
- 1)  $y = \frac{1}{4}(x + 3)^2 + 1$
- 2)  $y = \frac{1}{4}(x - 3)^2 + 1$
- 3)  $y = \frac{1}{8}(x + 3)^2 + 1$
- 4)  $y = \frac{1}{8}(x - 3)^2 + 1$

Algebra II Multiple Choice Regents Exam Questions

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- 17 In watching auditions for lead singer in a band, Liem became curious as to whether there is an association between how animated the lead singer is and the amount of applause from the audience. He decided to watch each singer and rate the singer on a scale of 1 to 5, where 1 is the least animated and 5 is the most animated. He did this for all 5 nights of auditions and found that the more animated singers did receive louder applause. The study Liem conducted would be best described as
- 1) experimental
  - 2) observational
  - 3) a sample survey
  - 4) a random assignment

- 18 The George family would like to borrow \$45,000 to purchase a new boat. They qualified for a loan with an annual interest rate of 6.75%. The monthly loan payment can be found using the formula below.

$$M = \frac{P\left(\frac{r}{12}\right)\left(1 + \frac{r}{12}\right)^n}{\left(1 + \frac{r}{12}\right)^n - 1}$$

$M$  = monthly payment

$P$  = amount borrowed

$r$  = annual interest rate

$n$  = number of monthly payments

What is the monthly payment if they would like to pay off the loan in five years?

- 1) \$262.99
  - 2) \$252.13
  - 3) \$915.24
  - 4) \$885.76
- 19 Which value, to the *nearest tenth*, is an approximate solution for the equation  $f(x) = g(x)$ , if  $f(x) = \frac{5}{x-3}$  and  $g(x) = 2(1.3)^x$ ?
- 1) 3.2
  - 2) 3.9
  - 3) 4.0
  - 4) 5.6

- 20 How many equations below are identities?
- $x^2 + y^2 = (x^2 - y^2) + (2xy)^2$
  - $x^3 + y^3 = (x - y) + (x^2 - xy + y^2)$
  - $x^4 + y^4 = (x - y)(x - y)(x^2 + y^2)$

- 1) 1
- 2) 2
- 3) 3
- 4) 0

- 21 Given  $f(x) = -\frac{2}{5}x + 4$ , which statement is true of the inverse function  $f^{-1}(x)$ ?

- 1)  $f^{-1}(x)$  is a line with slope  $\frac{5}{2}$ .
- 2)  $f^{-1}(x)$  is a line with slope  $\frac{2}{5}$ .
- 3)  $f^{-1}(x)$  passes through the point  $(6, -5)$ .
- 4)  $f^{-1}(x)$  has a y-intercept at  $(0, -4)$ .

- 22 Given the inverse function  $f^{-1}(x) = \frac{2}{3}x + \frac{1}{6}$ , which function represents  $f(x)$ ?

- 1)  $f(x) = -\frac{2}{3}x + \frac{1}{6}$
- 2)  $f(x) = -\frac{3}{2}x + \frac{1}{4}$
- 3)  $f(x) = \frac{3}{2}x - \frac{1}{4}$
- 4)  $f(x) = \frac{3}{2}x - \frac{1}{6}$

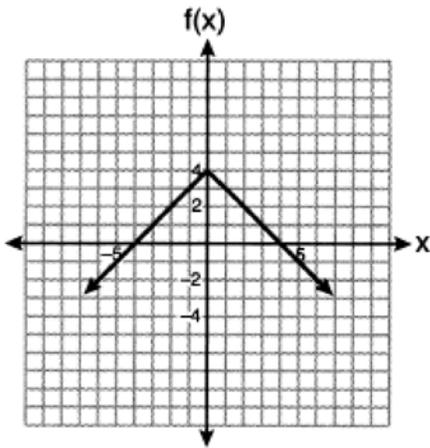
- 23 The average cost of a gallon of milk in the United States between the years of 1995 and 2018 can be modeled by the equation

$$P(t) = -0.0004t^3 + 0.0114t^2 - 0.0150t + 2.6602,$$

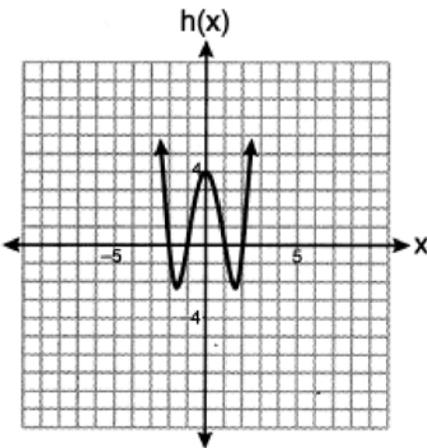
where  $P(t)$  represents the cost, in dollars, and  $t$  is time in years since January 1995. During this time period, in what year did  $P(t)$  reach its maximum?

- 1) 1995
- 2) 2013
- 3) 2014
- 4) 2018

- 24 Which function has a maximum y-value of 4 and a midline of  $y = 1$ ?



- 1)  
 2)  $g(x) = -3\cos(x) + 1$



- 3)  
 4)  $j(x) = 4\sin(x) + 1$

- 25 What are the solutions to  $4x^2 - 7x - 2 = -10$ ?

- 1)  $-\frac{1}{4}, 2$   
 2)  $\frac{7}{8} \pm \frac{\sqrt{79}}{8}i$   
 3)  $\frac{7}{8} \pm \frac{\sqrt{241}}{8}$   
 4)  $\frac{7}{8} \pm \frac{\sqrt{143}}{8}i$

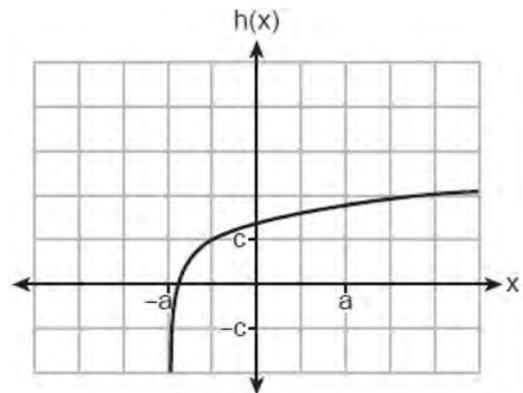
- 26 For all values of  $x$  for which the expression is defined,  $\frac{x^2 + 3x}{x^2 + 5x + 6}$  is equivalent to

- 1)  $1 - \frac{x}{x+2}$   
 2)  $\frac{x}{x+2}$   
 3)  $\frac{3x}{5x+6}$   
 4)  $1 + \frac{1}{2x+6}$

- 27 Given  $x > 0$ , the expression  $\frac{x^{\frac{1}{5}}}{x^{\frac{1}{2}}}$  can be rewritten as

- 1)  $\sqrt[3]{x}$   
 2)  $-\sqrt[10]{x^3}$   
 3)  $\frac{1}{\sqrt[10]{x^3}}$   
 4)  $\sqrt[3]{x^{10}}$

- 28 Which equation best represents the graph below?



- 1)  $h(x) = \log(x + a) + c$   
 2)  $h(x) = \log(x - a) + c$   
 3)  $h(x) = \log(x + a) - c$   
 4)  $h(x) = \log(x - a) - c$



36 Consider the data in the table below.

|        | Right Handed | Left Handed |
|--------|--------------|-------------|
| Male   | 87           | 13          |
| Female | 89           | 11          |

What is the probability that a randomly selected person is male given the person is left handed?

- 1)  $\frac{13}{200}$
- 2)  $\frac{13}{100}$
- 3)  $\frac{13}{50}$
- 4)  $\frac{13}{24}$

37 Which point is in Quadrant III and is a solution to the system below?

$$y = x^2 - 24$$

$$y = x - 12$$

- 1) (4, -8)
- 2) (-3, -15)
- 3) (-4, -16)
- 4) (-3, -33)

38 What is the solution for the system of equations below?

$$x + y + z = 2$$

$$x - 2y - z = -4$$

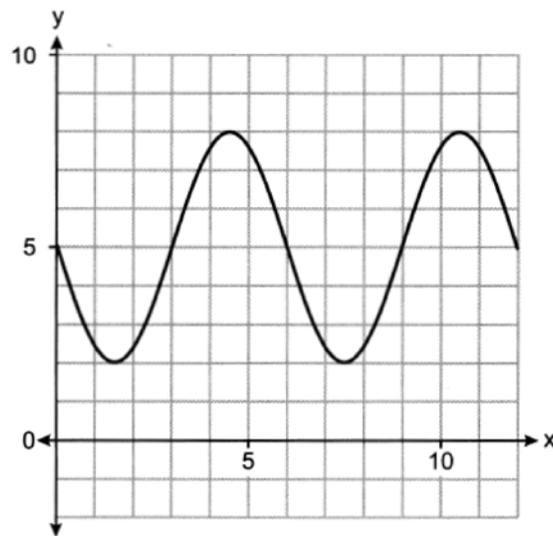
$$x - 9y + z = -18$$

- 1) (-2, 2, 2)
- 2) (-2, -2, 6)
- 3) (0, 2, 0)
- 4) (0, 2, 4)

39 Which expression is equivalent to  $\frac{2x^3 + 2x - 7}{2x + 4}$ ?

- 1)  $x^2 - 2x + 5 - \frac{27}{2x + 4}$
- 2)  $x^2 - 1 - \frac{3}{2x + 4}$
- 3)  $x^2 + 2x + 5 + \frac{13}{2x + 4}$
- 4)  $x^2 + 2x - 3 + \frac{5}{2x + 4}$

40 Which equation is graphed in the diagram below?



- 1)  $y = -3 \sin\left(\frac{\pi}{3}x\right) + 5$
- 2)  $y = -3 \cos\left(\frac{\pi}{3}x\right) + 5$
- 3)  $y = -5 \sin\left(\frac{\pi}{3}x\right) + 3$
- 4)  $y = -5 \cos\left(\frac{\pi}{3}x\right) + 3$

41 The growth of a \$500 investment can be modeled by the function  $P(t) = 500(1.03)^t$ , where  $t$  represents time in years. In terms of the monthly rate of growth, the value of the investment can be best approximated by

- 1)  $P(t) = 500(1.00247)^{12t}$
- 2)  $P(t) = 500(1.00247)^t$
- 3)  $P(t) = 500(1.03)^{12t}$
- 4)  $P(t) = 500(1.03)^{\frac{t}{12}}$

42 Which function represents exponential decay?

- 1)  $p(x) = \left(\frac{1}{4}\right)^{-x}$
- 2)  $q(x) = 1.8^{-x}$
- 3)  $r(x) = 2.3^{2x}$
- 4)  $s(x) = 4^{\frac{x}{2}}$

43 A rush-hour commuter train has arrived on time 64 of its first 80 days. As arrivals continue, which equation can be used to find  $x$ , the number of consecutive days that the train must arrive on schedule to raise its on-time performance rate to 90%?

- 1)  $\frac{64}{80+x} = \frac{90}{100}$
- 2)  $\frac{64+x}{80+x} = \frac{90}{100}$
- 3)  $\frac{64+x}{80} = \frac{90}{100}$
- 4)  $\frac{x}{80+x} = \frac{90}{100}$

44 The volume of a cardboard box can be modeled by  $V(x)$ , which is the product of the length, width, and height,  $x$ . If the length can be represented by  $L(x) = 18 - 2x$  and the width can be represented by  $W(x) = 18 - 2x$ , then which function represents  $V(x)$ ?

- 1)  $V(x) = 4x^2 - 72x + 324$
- 2)  $V(x) = 4x^3 - 72x^2 + 324x$
- 3)  $V(x) = -3x + 36$
- 4)  $V(x) = 4x^3 + 324x$

45 In a small city, there are 22 gas stations. The mean price for a gallon of regular gas was \$2.12 with a standard deviation of \$0.05. The distribution of the data was approximately normal. Given this information, the middle 95% of the gas stations in this small city likely charge

- 1) \$1.90 to \$2.34 for a gallon of gas
- 2) \$1.97 to \$2.27 for a gallon of gas
- 3) \$2.02 to \$2.22 for a gallon of gas
- 4) \$2.07 to \$2.17 for a gallon of gas

46 Robert is buying a car that costs \$22,000. After a down payment of \$4000, he borrows the remainder from a bank, a six year loan at 6.24% annual interest rate. The following formula can be used to calculate his monthly loan payment.

$$R = \frac{(P)(i)}{1 - (1 + i)^{-t}}$$

$R$  = monthly payment

$P$  = loan amount

$i$  = monthly interest rate

$t$  = time, in months

Robert's monthly payment will be

- 1) \$298.31
- 2) \$300.36
- 3) \$307.35
- 4) \$367.10

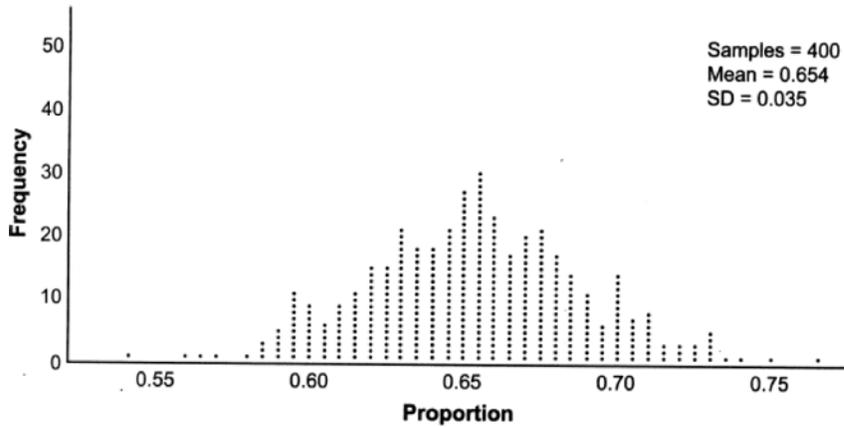
47 John and Margaret deposit \$500 into a savings account for their son on his first birthday. They continue to make a deposit of \$500 on the child's birthday, with the last deposit being made on the child's 21st birthday. If the account pays 4% annual interest, which equation represents the amount of money in the account after the last deposit is made?

- 1)  $S_{21} = 500(1.04)^{21}$
- 2)  $S_{21} = \frac{500(1 - 1.04^{21})}{1 - 1.04}$
- 3)  $S_{21} = 500(1.04)^{20} + 500$
- 4)  $S_{21} = \frac{500(1 - 0.04^{21})}{1 - 1.04}$

Algebra II Multiple Choice Regents Exam Questions

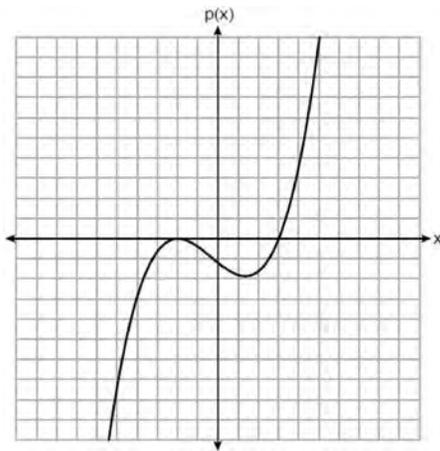
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- 48 Betty conducted a survey of her class to see if they like pizza. She gathered 200 responses and 65% of the voters said they did like pizza. Betty then ran a simulation of 400 more surveys, each with 200 responses, assuming that 65% of the voters would like pizza. The output of the simulation is shown below.



Considering the middle 95% of the data, what is the margin of error for the simulation?

- |         |         |
|---------|---------|
| 1) 0.01 | 3) 0.05 |
| 2) 0.02 | 4) 0.07 |
- 49 The graph of a cubic polynomial function  $p(x)$  is shown below.



If  $p(x)$  is written as a product of linear factors, which factor would appear twice?

- 1)  $x - 2$
- 2)  $x + 2$
- 3)  $x - 3$
- 4)  $x + 3$

- 50 To the *nearest tenth*, the solution to the equation  $4300e^{0.07x} - 123 = 5000$  is

- 1) 1.1
- 2) 2.5
- 3) 6.3
- 4) 68.5

- 51 Given  $\tan \theta = -\frac{4}{3}$  where  $\frac{\pi}{2} < \theta < \pi$ , what is the value of  $\sec \theta$ ?

- 1)  $-\frac{5}{3}$
- 2)  $-\frac{3}{5}$
- 3)  $\frac{4}{5}$
- 4)  $\frac{5}{3}$

- 52 What is the remainder when  $4x^3 - 3x + 3$  is divided by  $x - 2$ ?

- 1)  $-23$
- 2)  $-7$
- 3)  $13$
- 4)  $29$

Algebra II Multiple Choice Regents Exam Questions

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53 The temperature,  $F$ , in degrees Fahrenheit, after  $t$  hours of a roast put into an oven is given by the equation  $F = 325 - 185e^{-0.4t}$ . What was the temperature of the roast when it was put into the oven?

- 1) 325
- 2) 200
- 3) 185
- 4) 140

54 Consider the following patterns:

- I. 16, -12, 9, -6.75, ...
- II. 1, 4, 9, 16, ...
- III. 6, 18, 30, 42, ...
- IV.  $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \dots$

Which pattern is geometric?

- 1) I
- 2) II
- 3) III
- 4) IV

55 If a solution of  $2(2x - 1) = 5x^2$  is expressed in simplest  $a + bi$  form, the value of  $b$  is

- 1)  $\frac{\sqrt{6}}{5}i$
- 2)  $\frac{\sqrt{6}}{5}$
- 3)  $\frac{1}{5}i$
- 4)  $\frac{1}{5}$

56 The solution to the equation  $5e^{x+2} = 7$  is

- 1)  $-2 + \ln\left(\frac{7}{5}\right)$
- 2)  $\left(\frac{\ln 7}{\ln 5}\right) - 2$
- 3)  $\frac{-3}{5}$
- 4)  $-2 + \ln(2)$

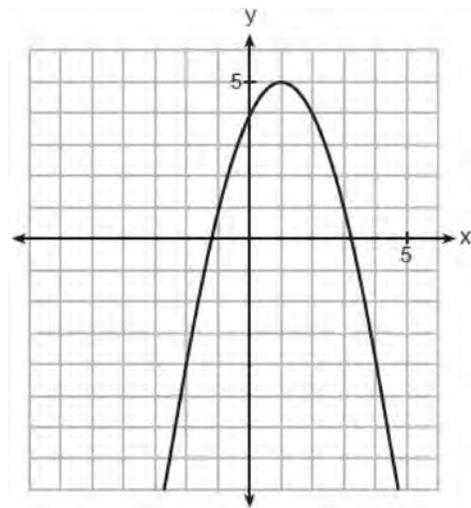
57 A parabola that has a vertex at  $(2, 1)$  and a focus of  $(2, -3)$  has an equation of

- 1)  $y = \frac{1}{16}(x - 2)^2 + 1$
- 2)  $y = -\frac{1}{16}(x + 2)^2 - 1$
- 3)  $y = -\frac{1}{16}(x - 2)^2 + 1$
- 4)  $y = -\frac{1}{16}(x - 2)^2 - 3$

58 Given the functions  $f(x) = 2x + \frac{5}{2}$  and  $g(x) = \frac{3}{x}$ , what are the solutions to  $f(x) = g(x)$ ?

- 1)  $(0.75, 4)$  or  $(-2, -1.5)$
- 2)  $x = 0.75$  or  $x = -2$
- 3)  $y = -1.5$  or  $y = 4$
- 4)  $(-2, 0.75)$

59 The graph of a quadratic function is shown below.



When the graph of  $x + y = 4$  is drawn on the same axes, one solution to this system is

- 1)  $(4, 0)$
- 2)  $(1, 5)$
- 3)  $(2, 2)$
- 4)  $(3, 1)$

60 What is the value of  $y$  for the system shown below?

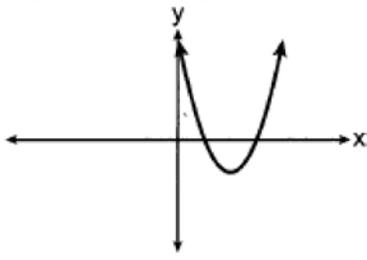
$$3x + 4y - 5z = -27$$

$$2x + 3y - z = -3$$

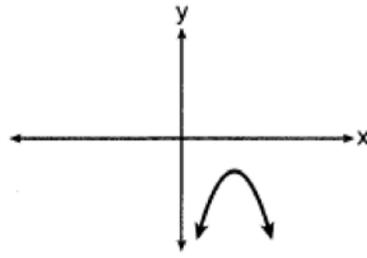
$$6x - y + 4z = 3$$

- 1)  $-27$
- 2)  $6$
- 3)  $3$
- 4)  $-3$

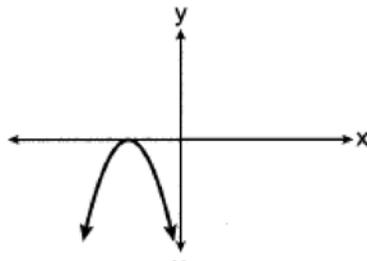
61 Which graph has imaginary roots?



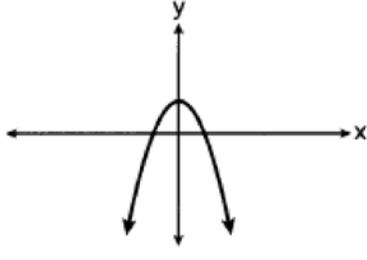
1)



2)



3)



4)

62 Given 3 is a root of  $f(x) = x^4 - x^3 - 21x^2 + 45x$ , what are the other unique roots of  $f(x)$ ?

- 1)  $-5$ , only
- 2)  $-5$  and  $0$
- 3)  $-3$ ,  $1$  and  $5$
- 4)  $-5$ ,  $-3$  and  $0$

63 The Hot and Tasty Coffee chain conducts a survey of its customers at its location at the Staten Island ferry terminal. After the survey is completed, the statistical consultant states that 70% of customers who took the survey said the most important factor in choosing where to get their coffee is how fast they are served. Based on this result, Hot and Tasty Coffee can infer that

- 1) most of its customers in New York State care most about being served quickly
- 2) coffee drinkers care less about taste and more about being served quickly
- 3) most of its customers at the Staten Island ferry terminal care most about being served quickly
- 4) most of its customers at transportation terminals and stations care most about being served quickly

64 If  $x - 5$  is a factor of

$p(x) = ax^4 + bx^3 + cx^2 + dx + e$ , then which statement must be true?

- 1)  $p(-5) = 0$
- 2)  $p(-5) \neq 0$
- 3)  $p(5) = 0$
- 4)  $p(5) \neq 0$

65 For all positive values of  $x$ , which expression is equivalent to  $\sqrt{x} \cdot \sqrt[4]{x^{11}}$ ?

- 1)  $x^{\frac{19}{22}}$
- 2)  $x^{\frac{11}{8}}$
- 3)  $x^{\frac{13}{4}}$
- 4)  $x^{\frac{2}{11}}$

66 Factored completely,  $x^4 + 4x^3 - 9x^2 - 36x$  is equivalent to

- 1)  $x(x + 9)(x - 9)(x + 4)$
- 2)  $x(x + 3)(x - 3)(x + 4)$
- 3)  $(x^3 - 9x)(x + 4)$
- 4)  $x(x^2 - 9)(x + 4)(x + 4)$

- 67 Given  $x \neq -2$ , the expression  $\frac{2x^2 + 5x + 8}{x + 2}$  is equivalent to
- 1)  $2x^2 + \frac{9}{x+2}$
  - 2)  $2x + \frac{7}{x+2}$
  - 3)  $2x + 1 + \frac{6}{x+2}$
  - 4)  $2x + 9 - \frac{10}{x+2}$
- 68 Abby is told that each day there is a 50% chance it will rain. Which simulation can Abby perform to determine the likelihood of it raining for the next seven days?
- 1) Flip a coin seven times, count how many heads, and repeat 50 times.
  - 2) Roll a die seven times, count how many twos, and repeat 50 times.
  - 3) Roll a pair of dice, count totals of seven, and repeat 50 times.
  - 4) Flip a coin 50 times and count how many heads.
- 69 Which expression is equivalent to  $(x - 2)^2 + 27(x - 2) - 90$ ?
- 1)  $(x + 30)(x - 3)$
  - 2)  $(x + 28)(x - 5)$
  - 3)  $(x - 30)(x + 3)$
  - 4)  $(x - 2)(x + 25)(x - 90)$
- 70 According to the USGS, an agency within the Department of Interior of the United States, the frog population in the U.S. is decreasing at the rate of 3.79% per year. A student created a model,  $P = 12,150(0.962)^t$ , to estimate the population in a pond after  $t$  years. The student then created a model that would predict the population after  $d$  decades. This model is best represented by
- 1)  $P = 12,150(0.461)^d$
  - 2)  $P = 12,150(0.679)^d$
  - 3)  $P = 12,150(0.996)^d$
  - 4)  $P = 12,150(0.998)^d$
- 71 If  $f(x) = \frac{1}{2}x + 2$ , then the inverse function is
- 1)  $f^{-1}(x) = -\frac{1}{2}x - 2$
  - 2)  $f^{-1}(x) = \frac{1}{2}x - 1$
  - 3)  $f^{-1}(x) = 2x - 4$
  - 4)  $f^{-1}(x) = 2x + 2$
- 72 Given  $f(x) = x^4 - x^3 - 6x^2$ , for what values of  $x$  will  $f(x) > 0$ ?
- 1)  $x < -2$ , only
  - 2)  $x < -2$  or  $x > 3$
  - 3)  $x < -2$  or  $0 \leq x \leq 3$
  - 4)  $x > 3$ , only
- 73 Which function is even?
- 1)  $f(x) = x^3 + 2$
  - 2)  $f(x) = x^2 + 1$
  - 3)  $f(x) = |x + 2|$
  - 4)  $f(x) = \sin(2x)$
- 74 If  $f(x) = 2x^4 - x^3 - 16x + 8$ , then  $f\left(\frac{1}{2}\right)$
- 1) equals 0 and  $2x + 1$  is a factor of  $f(x)$
  - 2) equals 0 and  $2x - 1$  is a factor of  $f(x)$
  - 3) does not equal 0 and  $2x + 1$  is not a factor of  $f(x)$
  - 4) does not equal 0 and  $2x - 1$  is a factor of  $f(x)$
- 75 The equation below can be used to model the height of a tide in feet,  $H(t)$ , on a beach at  $t$  hours.
- $$H(t) = 4.8 \sin\left(\frac{\pi}{6}(t + 3)\right) + 5.1$$
- Using this function, the amplitude of the tide is
- 1)  $\frac{\pi}{6}$
  - 2) 4.8
  - 3) 3
  - 4) 5.1

Algebra II Multiple Choice Regents Exam Questions

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76 The solution of  $\frac{x}{x+3} + \frac{2}{x-4} = \frac{2x+27}{x^2-x-12}$  is

- 1) -3
- 2) -7
- 3) 3
- 4) 7

77 The expression  $i^2(5x-2i)^2$  is equivalent to

- 1)  $-25x^2 + 20xi - 4$
- 2)  $-25x^2 + 20xi + 4$
- 3)  $25x^2 + 20xi + 4$
- 4)  $25x^2 + 4$

78 Which expression is *not* a solution to the equation  $2^t = \sqrt{10}$ ?

- 1)  $\frac{1}{2} \log_2 10$
- 2)  $\log_2 \sqrt{10}$
- 3)  $\log_4 10$
- 4)  $\log_{10} 4$

79 What is the solution set of  $x = \sqrt{3x+40}$ ?

- 1)  $\{-5, 8\}$
- 2)  $\{8\}$
- 3)  $\{-4, 10\}$
- 4)  $\{ \}$

80 The exact value of  $\sin\left(\frac{8\pi}{3}\right)$  is

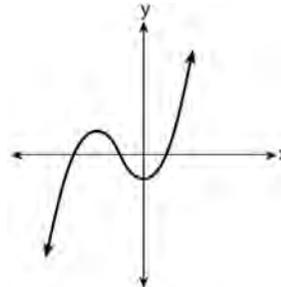
- 1)  $\frac{1}{2}$
- 2)  $-\frac{1}{2}$
- 3)  $-\frac{\sqrt{3}}{2}$
- 4)  $\frac{\sqrt{3}}{2}$

81 Consider the end behavior description below.

- as  $x \rightarrow -\infty, f(x) \rightarrow \infty$
- as  $x \rightarrow \infty, f(x) \rightarrow -\infty$

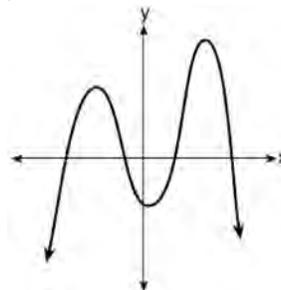
Which function satisfies the given conditions?

1)  $f(x) = x^4 + 2x^2 + 1$



2)

3)  $f(x) = -x^3 + 2x - 6$



4)

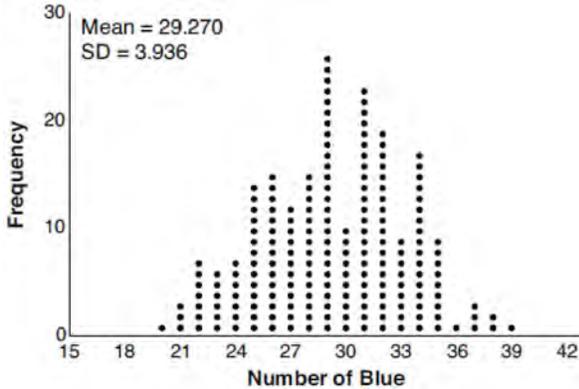
82 Monthly mortgage payments can be found using the formula below, where  $M$  is the monthly payment,  $P$  is the amount borrowed,  $r$  is the annual interest rate, and  $n$  is the total number of monthly payments.

$$M = \frac{P\left(\frac{r}{12}\right)\left(1 + \frac{r}{12}\right)^n}{\left(1 + \frac{r}{12}\right)^n - 1}$$

If Adam takes out a 15-year mortgage, borrowing \$240,000 at an annual interest rate of 4.5%, his monthly payment will be

- 1) \$1379.09
- 2) \$1604.80
- 3) \$1835.98
- 4) \$9011.94

- 83 The J& B candy company claims that 45% of the candies it produces are blue, 30% are brown, and 25% are yellow. Each bag holds 65 candies. A simulation was run 200 times, each of sample size 65, based on the premise that 45% of the candies are blue. The results of the simulation are shown below.

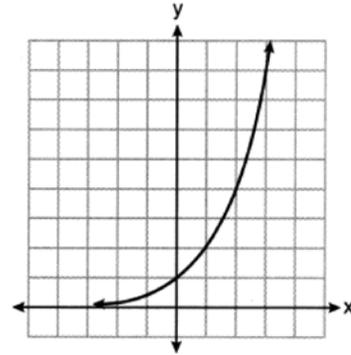


Bonnie purchased a bag of J& B's candy and counted 24 blue candies. What inference can be made regarding a bag of J& B's with only 24 blue candies?

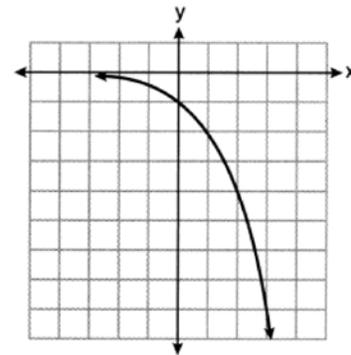
- 1) The company is not meeting their production standard.
  - 2) Bonnie's bag was a rarity and the company should not be concerned.
  - 3) The company should change their claim to 37% blue candies are produced.
  - 4) Bonnie's bag is within the middle 95% of the simulated data supporting the company's claim.
- 84 If  $4(10^{5x-2}) = 12$  then  $x$  equals

- 1)  $\frac{2.3}{5}$
- 2)  $\frac{1}{3} \left( \frac{\log 12}{\log 40} + 5 \right)$
- 3)  $\frac{\log(3) + 2}{5}$
- 4)  $\frac{1}{5} \left( \frac{\log 12}{\log 4} + 2 \right)$

- 85 Consider the function  $y = h(x)$ , defined by the graph below.

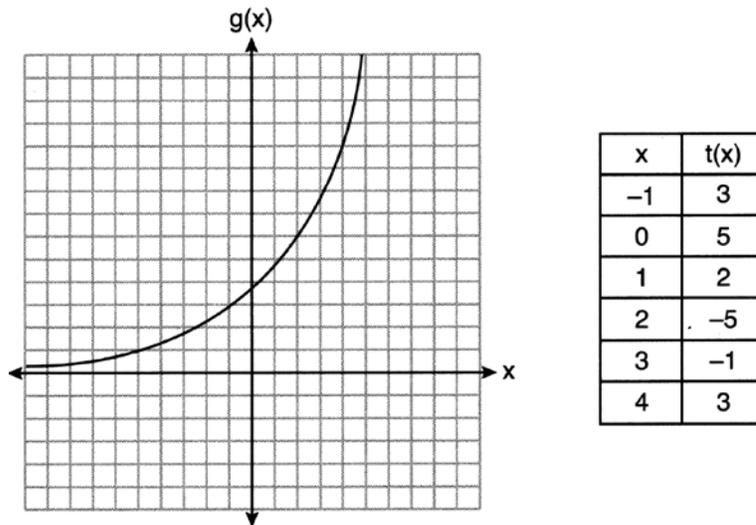


Which equation could be used to represent the graph shown below?



- 1)  $y = h(x) - 2$
  - 2)  $y = h(x - 2)$
  - 3)  $y = -h(x)$
  - 4)  $y = h(-x)$
- 86 If  $f(t) = 50(.5)^{\frac{t}{5715}}$  represents a mass, in grams, of carbon-14 remaining after  $t$  years, which statement(s) must be true?
- I. The mass of the carbon-14 is decreasing by half each year.
  - II. The mass of the original sample is 50 g.
- 1) I, only
  - 2) II, only
  - 3) I and II
  - 4) neither I nor II

87 Consider the graph of  $g$  and the table representing  $t$  below.



Over the interval  $[2, 4]$ , which statement regarding the average rate of change for  $g$  and  $t$  is true?

- 1)  $g$  has a greater average rate of change.
- 2) The average rates of change are equal.
- 3) The average rate of change for  $g$  is twice the average rate of change for  $t$ .
- 4) The average rate of change for  $g$  is half the average rate of change for  $t$ .

88 Given  $f(x) = x^4 + x^3 - 3x^2 + 9x - 108$  and  $f(3) = 0$ , which values satisfy  $f(x) = 0$ ?

- 1)  $-4, 3$  only
- 2)  $-3, 4$  only
- 3)  $\pm 3i, -4, 3$
- 4)  $\pm 3i, -3, 4$

89 The expression  $\frac{4x^2 - 5}{x^2 - 1}$  is equivalent to

- 1)  $4 - \frac{1}{x^2 - 1}$
- 2)  $4 + \frac{1}{x^2 - 1}$
- 3)  $4 - \frac{9}{x^2 - 1}$
- 4)  $4 - \frac{4}{x^2 - 1}$

90 To solve the equation  $\frac{7}{x+7} + \frac{4x}{x-7} = \frac{3x+7}{x-7}$ ,

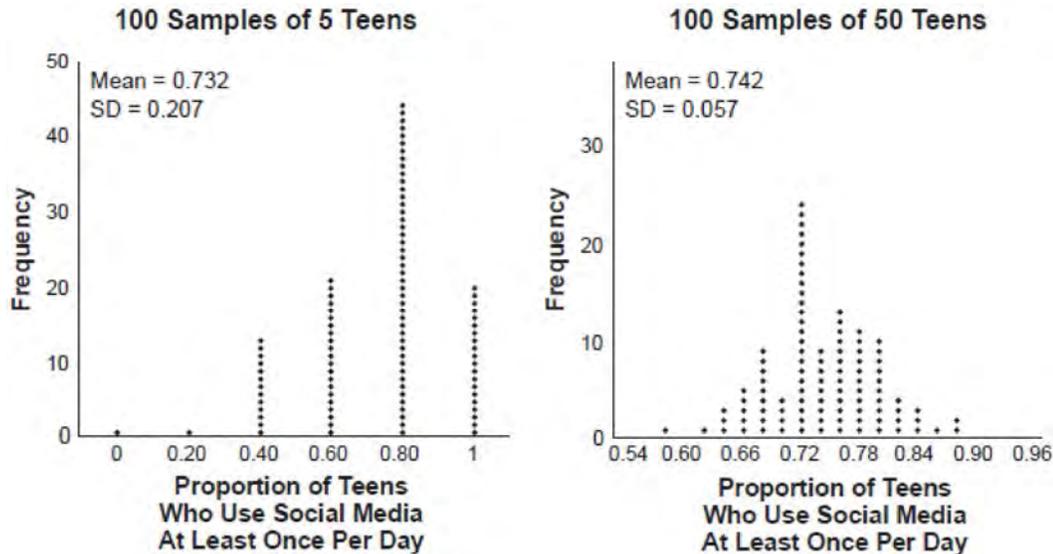
Joan's first step is to multiply both sides by the least common denominator. Which statement is true?

- 1)  $-14$  is an extraneous solution.
- 2)  $7$  and  $-7$  are extraneous solutions.
- 3)  $7$  is an extraneous solution.
- 4) There are no extraneous solutions.

91 A tree farm initially has 150 trees. Each year, 20% of the trees are cut down and 80 seedlings are planted. Which recursive formula models the number of trees,  $a_n$ , after  $n$  years?

- 1)  $a_1 = 150$   
 $a_n = a_{n-1}(0.2) + 80$
- 2)  $a_1 = 150$   
 $a_n = a_{n-1}(0.8) + 80$
- 3)  $a_n = 150(0.2)^n + 80$
- 4)  $a_n = 150(0.8)^n + 80$

92 Two surveys were conducted to estimate the proportion of teens who use social media at least once per day.



Based on these results, it was determined that approximately 75% of teens use social media at least once per day. What is the best explanation of the difference in the results between the two surveys?

- 1) The smaller sample size of five teens resulted in a smaller margin of error and should provide a more accurate estimate.
- 2) The smaller sample size of five teens resulted in a bigger margin of error and should provide a more accurate estimate.
- 3) The larger sample size of 50 teens resulted in a smaller margin of error and should provide a more accurate estimate.
- 4) The larger sample size of 50 teens resulted in a bigger margin of error and should provide a more accurate estimate.

93 The expression  $\frac{x^4 - 5x^2 + 4x + 14}{x + 2}$  is equivalent to

- 1)  $x^3 - 2x^2 - x + 6 + \frac{2}{x + 2}$
- 2)  $x^3 - 5x + 4 - \frac{14}{x + 2}$
- 3)  $x^3 + 2x^2 - x + 2 + \frac{18}{x + 2}$
- 4)  $x^3 + 2x^2 - 9x + 22 - \frac{30}{x + 2}$

94 Jin solved the equation  $\sqrt{4 - x} = x + 8$  by squaring both sides. What extraneous solution did he find?

- 1) -5
- 2) -12
- 3) 3
- 4) 4

95 If  $\cos A = \frac{\sqrt{5}}{3}$  and  $\tan A < 0$ , what is the value of  $\sin A$ ?

- 1)  $\frac{2}{3}$
- 2)  $-\frac{\sqrt{5}}{3}$
- 3)  $-\frac{2}{3}$
- 4)  $\frac{3}{\sqrt{5}}$

96 The asymptote of the graph of  $f(x) = 5 \log(x + 4)$  is

- 1)  $y = 6$
- 2)  $x = -4$
- 3)  $x = 4$
- 4)  $y = 5$



- 103 What is the value of  $\tan \theta$  when  $\sin \theta = \frac{2}{5}$  and  $\theta$  is in quadrant II?
- 1)  $-\frac{\sqrt{21}}{5}$
  - 2)  $-\frac{\sqrt{21}}{2}$
  - 3)  $\frac{-2}{\sqrt{21}}$
  - 4)  $\frac{2}{\sqrt{21}}$
- 104 The expression  $\frac{x^2 + 12}{x^2 + 3}$  can be rewritten as
- 1)  $\frac{10}{x^2 + 3}$
  - 2)  $1 + \frac{9}{x^2 + 3}$
  - 3)  $x + 9$
  - 4) 4
- 105 Written in simplest form, the fraction  $\frac{x^3 - 9x}{9 - x^2}$ , where  $x \neq \pm 3$ , is equivalent to
- 1)  $-x$
  - 2)  $x$
  - 3)  $\frac{-x(x + 3)}{(3 + x)}$
  - 4)  $\frac{x(x - 3)}{(3 - x)}$
- 106 A parabola has a directrix of  $y = 3$  and a vertex at  $(2, 1)$ . Which ordered pair is the focus of the parabola?
- 1)  $(2, -1)$
  - 2)  $(2, 0)$
  - 3)  $(2, 2)$
  - 4)  $(2, 5)$
- 107 A family owned grocery store in New Hartford, NY employs 49 people whose ages are approximately normally distributed with a mean of 36 years and a standard deviation of 6.2 years. Ryan has been hired to work at this store. He is 30 years old. How many people who work at this store would you expect to be younger than Ryan?
- 1) 17
  - 2) 7
  - 3) 41
  - 4) 8
- 108 To prepare for lacrosse tryouts, Kole is increasing the amount of time he spends at the gym. This week he is spending 150 minutes there and he plans to increase this amount by 2% each week. The amount of time, in minutes, that he plans to spend at the gym  $t$  weeks from now is given by the function  $A(t) = 150(1.02)^t$ . In terms of a daily growth rate, the amount of time Kole is planning to spend at the gym can best be modeled by the function
- 1)  $A(t) = 150(1.14869)^{\frac{t}{7}}$
  - 2)  $A(t) = 150(1.14869)^{7t}$
  - 3)  $A(t) = 150(1.00283)^{\frac{t}{7}}$
  - 4)  $A(t) = 150(1.00283)^{7t}$
- 109 The solution set for the equation  $\sqrt{3(x + 6)} = x$  is
- 1)  $\{6, -3\}$
  - 2)  $\{-6, 3\}$
  - 3)  $\{6\}$
  - 4)  $\{-3\}$
- 110 Given  $x \neq -3$ , which expression is equivalent to  $\frac{2x^3 + 3x^2 - 4x + 5}{x + 3}$ ?
- 1)  $2x^3 + 9x^2 + 23x + 74$
  - 2)  $2x^2 - 3x + 5 - \frac{10}{x + 3}$
  - 3)  $2x^3 - 3x^2 + 5x - 10$
  - 4)  $2x^2 + 9x + 23 + \frac{74}{x + 3}$

Algebra II Multiple Choice Regents Exam Questions

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- 111 Which statement about data collection is most accurate?
- 1) A survey about parenting styles given to every tenth student entering the library will provide unbiased results.
  - 2) An observational study allows a researcher to determine the cause of an outcome.
  - 3) Margin of error increases as sample size increases.
  - 4) A survey collected from a random sample of students in a school can be used to represent the opinions of the school population.
- 112 The inverse of  $f(x) = -6x + \frac{1}{2}$  is
- 1)  $f^{-1}(x) = 6x - \frac{1}{2}$
  - 2)  $f^{-1}(x) = \frac{1}{-6x + \frac{1}{2}}$
  - 3)  $f^{-1}(x) = -\frac{1}{6}x + \frac{1}{12}$
  - 4)  $f^{-1}(x) = -\frac{1}{6}x + 2$
- 113 For the function  $d(x) = \sqrt[3]{x+2}$ , the inverse function,  $d^{-1}(x)$ , equals
- 1)  $\sqrt[3]{x+2}$
  - 2)  $x^3 + 2$
  - 3)  $-\sqrt[3]{x+2}$
  - 4)  $x^3 - 2$
- 114 If  $f(x) = \sqrt[3]{x} + 4$ , then  $f^{-1}(x)$  equals
- 1)  $\sqrt[3]{x-4}$
  - 2)  $(x-4)^3$
  - 3)  $x^3 + \frac{1}{4}$
  - 4)  $-\sqrt[3]{x} - 4$
- 115 A group of high school students wanted to collect information on how many times per week students exercised. If they want the *least* biased results they should survey every fifth student at the school who is
- 1) entering the gym
  - 2) in the junior class
  - 3) entering the library
  - 4) entering the building
- 116 The roots of the equation  $x^2 - 4x = -13$  are
- 1)  $2 \pm 3i$
  - 2)  $2 \pm 6i$
  - 3)  $2 \pm \sqrt{17}$
  - 4)  $2 \pm \sqrt{13}$
- 117 Which value, to the *nearest tenth*, is the *smallest* solution of  $f(x) = g(x)$  if  $f(x) = 3 \sin\left(\frac{1}{2}x\right) - 1$  and  $g(x) = x^3 - 2x + 1$ ?
- 1) -3.6
  - 2) -2.1
  - 3) -1.8
  - 4) 1.4
- 118 The graph of which function has a period of 3?
- 1)  $y = -7 \sin\left(\frac{2\pi}{3}x\right) - 5$
  - 2)  $y = -7 \sin\left(\frac{3\pi}{2}x\right) + 9$
  - 3)  $y = -7 \sin(3x) - 5$
  - 4)  $y = 3 \sin(\pi x) + 9$
- 119 If  $f(x) = 12x - 4$ , then the inverse function  $f^{-1}(x)$  is
- 1)  $f^{-1}(x) = \frac{x+1}{3}$
  - 2)  $f^{-1}(x) = \frac{x}{3} + 1$
  - 3)  $f^{-1}(x) = \frac{x+4}{12}$
  - 4)  $f^{-1}(x) = \frac{x}{12} + 4$

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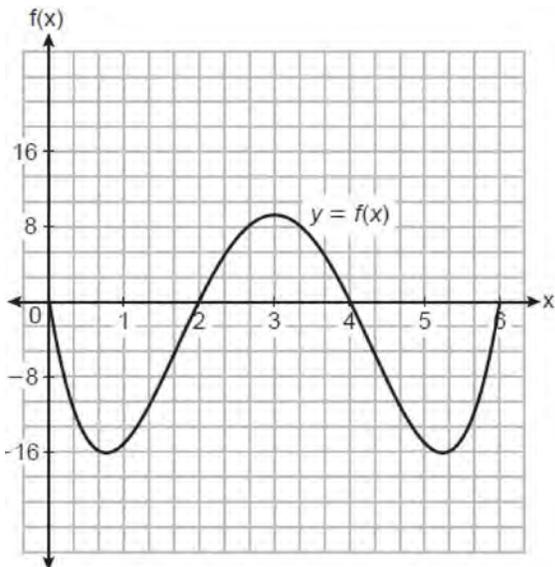
- 120 The heights of the students at Central High School can be modeled by a normal distribution with a mean of 68.1 and a standard deviation of 3.4 inches. According to this model, approximately what percent of the students would have a height less than 60 inches or greater than 75 inches?
- 1) 0.86%
  - 2) 1.26%
  - 3) 2.12%
  - 4) 2.98%
- 121 Given that  $i$  is the imaginary unit, the expression  $(x - 2i)^2$  is equivalent to
- 1)  $x^2 + 4$
  - 2)  $x^2 - 4$
  - 3)  $x^2 - 2xi - 4$
  - 4)  $x^2 - 4xi - 4$
- 122 A culture of 1000 bacteria triples every 10 hours. Which expression models the number of bacteria in the sample after  $t$  hours?
- 1)  $1000e^{3t}$
  - 2)  $1000(3)^t$
  - 3)  $1000(3)^{10t}$
  - 4)  $1000(3)^{\frac{t}{10}}$
- 123 What is the solution set of the equation  $\frac{4}{k^2 - 8k + 12} = \frac{k}{k - 2} + \frac{1}{k - 6}$ ?
- 1)  $\{-1, 6\}$
  - 2)  $\{1, -6\}$
  - 3)  $\{-1\}$
  - 4)  $\{1\}$
- 124 A research assistant receives a first year salary of \$90,000 and a 2% annual raise throughout the first ten years of employment. In total, how much money will be earned over the first ten years, to the nearest dollar?
- 1) \$91,837
  - 2) \$109,709
  - 3) \$877,917
  - 4) \$985,475
- 125 Mia has a student loan that is in deferment, meaning that she does not need to make payments right now. The balance of her loan account during her deferment can be represented by the function  $f(x) = 35,000(1.0325)^x$ , where  $x$  is the number of years since the deferment began. If the bank decides to calculate her balance showing a monthly growth rate, an approximately equivalent function would be
- 1)  $f(x) = 35,000(1.0027)^{12x}$
  - 2)  $f(x) = 35,000(1.0027)^{\frac{x}{12}}$
  - 3)  $f(x) = 35,000(1.0325)^{12x}$
  - 4)  $f(x) = 35,000(1.0325)^{\frac{x}{12}}$
- 126 Stone Manufacturing has developed a cost model,  $C(x) = 0.18x^3 + 0.02x^2 + 4x + 180$ , where  $x$  is the number of sprockets sold, in thousands. The sales price can be modeled by  $S(x) = 95.4 - 6x$  and the company's revenue by  $R(x) = x \cdot S(x)$ . The company's profits,  $R(x) - C(x)$ , could be modeled by
- 1)  $0.18x^3 + 6.02x^2 + 91.4x + 180$
  - 2)  $0.18x^3 - 5.98x^2 - 91.4x + 180$
  - 3)  $-0.18x^3 - 6.02x^2 + 91.4x - 180$
  - 4)  $0.18x^3 + 5.98x^2 + 99.4x + 180$
- 127 Audra is interested in studying the number of students entering kindergarten in the Ahlville Central School District over the next several years. Using data dating back to 2015, she determines that the number of kindergarteners is decreasing at an exponential rate. She creates a formula to model this situation  $y = a(b)^x$ , where  $x$  is the number of years since 2015 and  $y$  is the number of students entering kindergarten. If there were 105 students entering kindergarten in Ahlville in 2015, which statement about Audra's formula is true?
- 1)  $a$  is positive and  $b$  is negative.
  - 2)  $a$  is negative and  $b$  is positive.
  - 3) Both  $a$  and  $b$  are positive.
  - 4) Both  $a$  and  $b$  are negative.

Algebra II Multiple Choice Regents Exam Questions

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- 128 The expression  $3i(ai - 6i^2)$  is equivalent to
- 1)  $3a + 18i$
  - 2)  $3a - 18i$
  - 3)  $-3a + 18i$
  - 4)  $-3a - 18i$
- 129 Given  $x > 0$ , the expression  $\left(\frac{1}{x^{-2}}\right)^{-\frac{3}{4}}$  is equivalent to
- 1)  $x\sqrt{x}$
  - 2)  $\frac{1}{x\sqrt{x}}$
  - 3)  $\sqrt[3]{x^2}$
  - 4)  $\frac{1}{\sqrt[3]{x^2}}$
- 130 The roots of the equation  $0 = x^2 + 6x + 10$  in simplest  $a + bi$  form are
- 1)  $-3 \pm 2i$
  - 2)  $-6 \pm i$
  - 3)  $-3 \pm i$
  - 4)  $-3 \pm i\sqrt{2}$
- 131 If the focus of a parabola is  $(0, 6)$  and the directrix is  $y = 4$ , what is an equation for the parabola?
- 1)  $y^2 = 4(x - 5)$
  - 2)  $x^2 = 4(y - 5)$
  - 3)  $y^2 = 8(x - 5)$
  - 4)  $x^2 = 8(y - 6)$
- 132 A cafeteria food manager studied the lunchtime eating habits of a group of employees in their office building. The purpose of the study was to determine the proportion of employees who purchased lunch in the cafeteria, brought their lunch from home, or purchased lunch from an outside vendor. This collection of data would best be classified as
- 1) a census
  - 2) an experiment
  - 3) an observational study
  - 4) a simulation
- 133 The profit function,  $p(x)$ , is found by subtracting the cost function,  $c(x)$ , from the revenue function,  $r(x)$ . Which function below represents the cost function given  $p(x) = -15x^2 + 600x + 60$  and  $r(x) = -0.4x^2 + 130x + 1200$ ?
- 1)  $c(x) = -14.6x^2 + 470x - 1140$
  - 2)  $c(x) = -14.6x^2 + 730x - 1260$
  - 3)  $c(x) = 14.6x^2 - 470x + 1140$
  - 4)  $c(x) = 14.6x^2 + 730x - 1260$
- 134 The expression  $\left(a^3\sqrt{2b^2}\right)\left(\sqrt[3]{4a^2b}\right)$  is equivalent to
- 1)  $2ab^3\sqrt{a^2}$
  - 2)  $2ab$
  - 3)  $2ab^3\sqrt{2a^2}$
  - 4)  $2a^2b^3\sqrt{2b}$
- 135 Given  $p(\theta) = 3\sin\left(\frac{1}{2}\theta\right)$  on the interval  $-\pi < \theta < \pi$ , the function  $p$
- 1) decreases, then increases
  - 2) increases, then decreases
  - 3) decreases throughout the interval
  - 4) increases throughout the interval
- 136 In a survey of people who recently bought a laptop, 45% said they were looking for a large screen, 31% said they were looking for a fast processor, and 58% said they wanted a large screen or a fast processor. If a survey respondent is selected at random, what is the probability that the respondent wanted both a large screen and a fast processor?
- 1) 76%
  - 2) 14%
  - 3) 77%
  - 4) 18%

- 137 The height of a running trail is modeled by the quartic function  $y = f(x)$  shown below, where  $x$  is the distance in miles from the start of the trail and  $y$  is the height in feet relative to sea level.

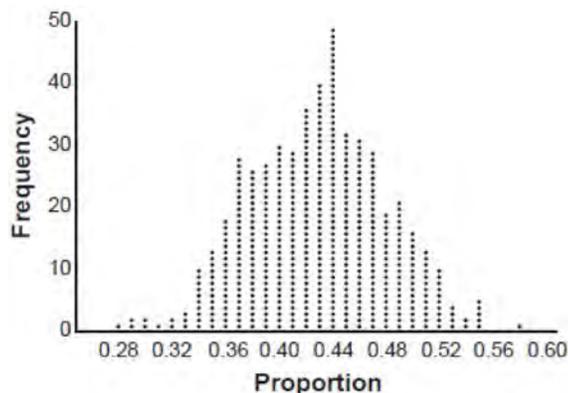


If this trail has a minimum height of 16 feet below sea level, which function(s) could represent a running trail whose minimum height is half of the minimum height of the original trail?

I.  $y = f\left(\frac{1}{2}x\right)$    II.  $y = f(x) + 8$    III.  $y = \frac{1}{2}f(x)$

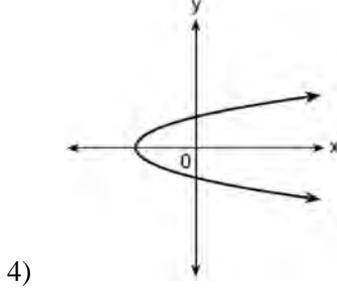
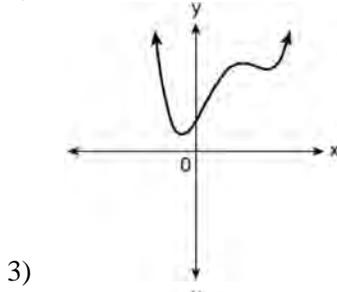
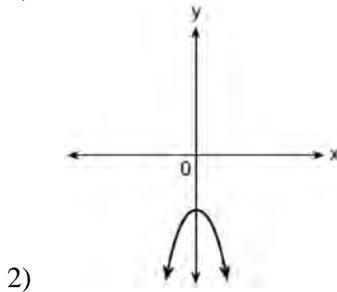
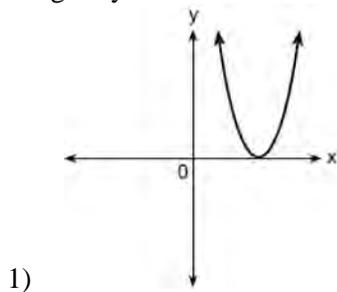
- 1) I, only
  - 2) II, only
  - 3) I and III
  - 4) II and III
- 138 The amount of a substance,  $A(t)$ , in grams, remaining after  $t$  days is modeled by  $A(t) = 50(0.5)^{\frac{t}{3}}$ . Which statement is false?
- 1) In 20 days, there is no substance remaining.
  - 2) After two half-lives, there is 25% of the substance remaining.
  - 3) The amount of the substance remaining can also be modeled by  $A(t) = 50(2)^{\frac{-t}{3}}$ .
  - 4) After one week, there is less than 10g of the substance remaining.

- 139 Which statement regarding polynomials and their zeros is true?
- 1)  $f(x) = (x^2 - 1)(x + a)$  has zeros of 1 and  $-a$ , only.
  - 2)  $f(x) = x^3 - ax^2 + 16x - 16a$  has zeros of 4 and  $a$ , only.
  - 3)  $f(x) = (x^2 + 25)(x + a)$  has zeros of  $\pm 5$  and  $-a$ .
  - 4)  $f(x) = x^3 - ax^2 - 9x + 9a$  has zeros of  $\pm 3$  and  $a$ .
- 140 Which equation does *not* represent an identity?
- 1)  $x^2 - y^2 = (x + y)(x - y)$
  - 2)  $(x - y)^2 = (x - y)(x - y)$
  - 3)  $(x + y)^2 = x^2 + 2xy + y^2$
  - 4)  $(x + y)^3 = x^3 + 3xy + y^3$
- 141 Marissa and Sydney are trying to determine if there is enough interest in their school to put on a senior musical. They randomly surveyed 100 members of the senior class and 43% of them said they would be interested in being in a senior musical. Marissa and Sydney then conducted a simulation of 500 more surveys, each of 100 seniors, assuming that 43% of the senior class would be interested in being in the musical. The output of the simulation is shown below.



- The standard deviation of the simulation is closest to
- 1) 0.02
  - 2) 0.05
  - 3) 0.09
  - 4) 0.43

- 142 Which graph shows a quadratic function with two imaginary zeros?



- 143 Given  $f(x) = 2x^3 - 3x^2 - 5x - 12$  and  $g(x) = x - 3$ , the quotient of  $\frac{f(x)}{g(x)}$  is

- 1)  $2x^2 + 3x + 4$
- 2)  $2x^3 + 3x^2 + 4x$
- 3)  $2x^2 - 9x + 22 - \frac{78}{x - 3}$
- 4)  $2x^3 - 9x^2 + 22x - 78$

- 144 A grocery store owner wonders how many customers bring reusable bags to the store. An employee stands at the store entrance for two hours and counts the number of people bringing in reusable bags. This type of study is best classified as

- 1) a census
- 2) an experiment
- 3) an observational study
- 4) a survey

- 145 The equations  $y = 3t + 6$  and  $y = (1.82)^t$  approximately model the growth of two separate populations where  $t > 0$ . What is the best approximation of the time,  $t$ , at which the populations are the same?

- 1)  $-1.9$
- 2)  $0.3$
- 3)  $5.1$
- 4)  $21.3$

- 146 The expression  $(x^2 + 3)^2 - 2(x^2 + 3) - 24$  is equivalent to

- 1)  $(x^2 + 9)(x^2 - 1)$
- 2)  $(x^2 - 3)(x^2 + 7)$
- 3)  $x^4 - 2x^2 - 21$
- 4)  $x^4 + 4x^2 - 9$

- 147 Consider the system of equations below?

$$x + 2y - z = 1$$

$$-x - 3y + 2z = 0$$

$$2x - 4y + z = 10$$

What is the solution to the given system of equations?

- 1)  $(1, 1, 2)$
- 2)  $(3, -1, 0)$
- 3)  $(5, -1, 2)$
- 4)  $(3, 5, 8)$

- 148 The graph of  $y = 2^x - 4$  is positive on which interval?

- 1)  $(-\infty, \infty)$
- 2)  $(2, \infty)$
- 3)  $(0, \infty)$
- 4)  $(-4, \infty)$

Algebra II Multiple Choice Regents Exam Questions

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- 149 Consider the system below.
- $$x + y + z = 9$$
- $$x - y - z = -1$$
- $$x - y + z = 21$$
- Which value is *not* in the solution,  $(x, y, z)$ , of the system?
- 1) -8
  - 2) -6
  - 3) 11
  - 4) 4
- 150 According to a study, 45% of Americans have type O blood. If a random number generator produces three-digit values from 000 to 999, which values would represent those having type O blood?
- 1) between 000 and 045, inclusive
  - 2) between 000 and 444, inclusive
  - 3) between 000 and 449, inclusive
  - 4) between 000 and 450, inclusive
- 151 For which equations will the value  $s = 4$  make the statement an identity?
- I  $(2x - 3)^2 = 4x^2 - 3sx + 9$
- II  $(x - 2)^3 = (x - 2)(x^2 + sx + s)$
- 1) I, only
  - 2) II, only
  - 3) I and II
  - 4) neither I nor II
- 152 Expressed in simplest  $a + bi$  form,  $(7 - 3i) + (x - 2i)^2 - (4i + 2x^2)$  is
- 1)  $(3 - x^2) - (4x + 7)i$
  - 2)  $(3 + 3x^2) - (4x + 7)i$
  - 3)  $(3 - x^2) - 7i$
  - 4)  $(3 + 3x^2) - 7i$
- 153 A population is normally distributed with a mean of 23 and a standard deviation of 1.2. The percentage of the population that falls below 21, to the *nearest hundredth*, is
- 1) 0.05
  - 2) 4.78
  - 3) 8.29
  - 4) 91.30
- 154 The crew aboard a small fishing boat caught 350 pounds of fish on Monday. From that Monday through the end of the week on Friday, the weight of the fish caught increased 15% per day. The total weight, in pounds, of fish caught is approximately
- 1) 411
  - 2) 612
  - 3) 1748
  - 4) 2360
- 155 For which approximate value(s) of  $x$  will  $\log(x + 5) = |x - 1| - 3$ ?
- 1) 5, 1
  - 2) -2.41, 0.41
  - 3) -2.41, 5
  - 4) 5, only
- 156 The average monthly temperature,  $T(m)$ , in degrees Fahrenheit, over a 12 month period, can be modeled by  $T(m) = -23 \cos\left(\frac{\pi}{6} m\right) + 56$ , where  $m$  is in months. What is the range of temperatures, in degrees Fahrenheit, of this function?
- 1)  $[-23, 23]$
  - 2)  $[33, 79]$
  - 3)  $[-23, 56]$
  - 4)  $[-79, 33]$
- 157 A local university has a current enrollment of 12,000 students. The enrollment is increasing continuously at a rate of 2.5% each year. Which logarithm is equal to the number of years it will take for the population to increase to 15,000 students?
- 1)  $\frac{\ln 1.25}{0.25}$
  - 2)  $\frac{\ln 3000}{0.025}$
  - 3)  $\frac{\ln 1.25}{2.5}$
  - 4)  $\frac{\ln 1.25}{0.025}$

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158 Given the polynomial identity  $x^6 + y^6 = (x^2 + y^2)(x^4 - x^2y^2 + y^4)$ , which equation must also be true for all values of  $x$  and  $y$ ?

- 1)  $x^6 + y^6 = x^2(x^4 - x^2y^2 + y^4) + y^2(x^4 - x^2y^2 + y^4)$
- 2)  $x^6 + y^6 = (x^2 + y^2)(x^2 - y^2)(x^2 - y^2)$
- 3)  $(x^3 + y^3)^2 = (x^2 + y^2)(x^4 - x^2y^2 + y^4)$
- 4)  $(x^6 + y^6) - (x^2 + y^2) = x^4 - x^2y^2 + y^4$

159 Consider the function  $f(x) = 2x^3 + x^2 - 18x - 9$ . Which statement is true?

- 1)  $2x - 1$  is a factor of  $f(x)$ .
- 2)  $x - 3$  is a factor of  $f(x)$ .
- 3)  $f(3) \neq f\left(-\frac{1}{2}\right)$
- 4)  $f\left(\frac{1}{2}\right) = 0$

160 Given  $x \neq -3$ , the expression  $\frac{2x^3 + 7x^2 - 3x - 25}{x + 3}$  is equivalent to

- 1)  $2x^2 + x - 6 - \frac{7}{x + 3}$
- 2)  $2x^2 + 13x - 36 + \frac{83}{x + 3}$
- 3)  $2x^2 + x - 13$
- 4)  $x^2 + 4x - 15 + \frac{20}{x + 3}$

161 Which expression is equivalent to  $2xy^2\sqrt[3]{x^2y}$ ?

- 1)  $2x^{\frac{5}{3}}y^{\frac{7}{3}}$
- 2)  $2xy$
- 3)  $2x^{\frac{2}{3}}y^{\frac{2}{3}}$
- 4)  $2x^7y^4$

162 The expression  $(x^2 + y^2)^2$  is *not* equivalent to

- 1)  $(x^2 - y^2)^2 + (2xy)^2$
- 2)  $(x + y)^4 + 2(xy)^2$
- 3)  $x^2(x^2 + 2y^2) + (y^2)^2$
- 4)  $(2x^2 + y^2)^2 - (3x^4 + 2x^2y^2)$

163 Given  $\sin \theta = \frac{7}{25}$  and  $\theta$  terminates in quadrant II, what is the value of  $\tan \theta$ ?

- 1)  $-\frac{7}{24}$
- 2)  $-\frac{24}{7}$
- 3)  $\frac{7}{24}$
- 4)  $\frac{24}{7}$

164 Given  $x$  and  $y$  are positive, which expressions are equivalent to  $\frac{x^3}{y}$ ?

I.  $\left(\frac{y}{x^3}\right)^{-1}$     II.  $\sqrt[3]{x^9}(y^{-1})$     III.  $\frac{x^{64}\sqrt[4]{y^8}}{x^3y^3}$

- 1) I and II, only
- 2) I and III, only
- 3) II and III, only
- 4) I, II, and III

165 The amount of a substance,  $A(t)$ , that remains after  $t$  days can be given by the equation

$A(t) = A_0(0.5)^{\frac{t}{0.0803}}$ , where  $A_0$  represents the initial amount of the substance. An equivalent form of this equation is

- 1)  $A(t) = A_0(0.000178)^t$
- 2)  $A(t) = A_0(0.945861)^t$
- 3)  $A(t) = A_0(0.04015)^t$
- 4)  $A(t) = A_0(1.08361)^t$

Algebra II Multiple Choice Regents Exam Questions

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- 166 A company fired several employees in order to save money. The amount of money the company saved per year over five years following the loss of employees is shown in the table below.

| Year | Amount Saved<br>(in dollars) |
|------|------------------------------|
| 1    | 59,000                       |
| 2    | 64,900                       |
| 3    | 71,390                       |
| 4    | 78,529                       |
| 5    | 86,381.9                     |

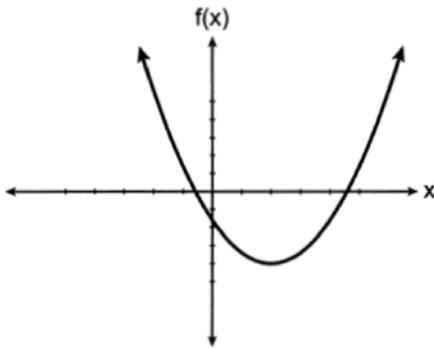
Which expression determines the total amount of money saved by the company over 5 years?

- 1)  $\frac{59,000 - 59,000(1.1)^5}{1 - 1.1}$       3)  $\sum_{n=1}^5 59,000(1.1)^n$   
 2)  $\frac{59,000 - 59,000(0.1)^5}{1 - 0.1}$       4)  $\sum_{n=1}^5 59,000(0.1)^{n-1}$

- 167 If  $(6 - ki)^2 = 27 - 36i$ , the value of  $k$  is

- 1)  $-36$   
 2)  $-3$   
 3)  $3$   
 4)  $6$

- 168 If  $f(x)$  is represented by the graph below, which translation of  $f(x)$  would have imaginary roots?



- 1)  $f(x + 5)$   
 2)  $f(x - 5)$   
 3)  $f(x) + 5$   
 4)  $f(x) - 5$

- 169 Which expression is equivalent to

$$\frac{6x^4 + 4x^3 + x + 200}{x + 2}?$$

- 1)  $6x^2 - 8x + 17 + \frac{166}{x + 2}$   
 2)  $6x^2 + 16x + 33 + \frac{266}{x + 2}$   
 3)  $6x^3 + 16x^2 + 32x + 65 + \frac{330}{x + 2}$   
 4)  $6x^3 - 8x^2 + 16x - 31 + \frac{262}{x + 2}$

- 170 If  $\theta$  is an angle in standard position whose terminal side passes through the point  $(-3, -4)$ , which statement is true?

- 1)  $\sec \theta > 0$  and  $\tan \theta > 0$   
 2)  $\sec \theta < 0$  and  $\tan \theta < 0$   
 3)  $\sec \theta > 0$  and  $\tan \theta < 0$   
 4)  $\sec \theta < 0$  and  $\tan \theta > 0$

- 171 Given  $i$  is the imaginary unit, which expression is equivalent to  $5i(2x + 3i) - x\sqrt{-9}$ ?

- 1)  $15 + 13xi$   
 2)  $-15 + 13xi$   
 3)  $15 + 7xi$   
 4)  $-15 + 7xi$

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172 The number of employees who work nights and weekends at a department store is summarized in the table below.

|                       | Works Nights | Doesn't Work Nights |
|-----------------------|--------------|---------------------|
| Works Weekends        | 8            | 40                  |
| Doesn't Work Weekends | 12           | 60                  |

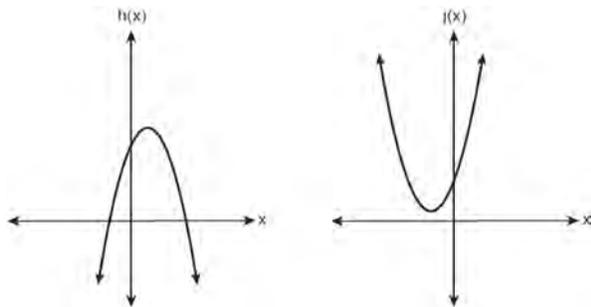
Let  $N$  represent the event "works nights" and let  $W$  represent the event "works weekends." Based on the table, are  $N$  and  $W$  independent events?

- 1) Yes, because  $P(N) \cdot P(W) = P(N \cap W)$ .    3) No, because  $P(N) \cdot P(W) = P(N \cap W)$ .  
 2) Yes, because  $P(N) \cdot P(W) \neq P(N \cap W)$ .    4) No, because  $P(N) \cdot P(W) \neq P(N \cap W)$ .

173 As  $\theta$  increases from  $-\frac{\pi}{2}$  to 0 radians, the value of  $\cos \theta$  will

- 1) decrease from 1 to 0  
 2) decrease from 0 to  $-1$   
 3) increase from  $-1$  to 0  
 4) increase from 0 to 1

174 In the quadratic formula,  $b^2 - 4ac$  is called the discriminant. The function  $f(x)$  has a discriminant value of 8, and  $g(x)$  has a discriminant value of  $-16$ . The quadratic graphs,  $h(x)$  and  $j(x)$ , are shown below.



Which quadratic functions have imaginary roots?

- 1)  $g(x)$  and  $h(x)$   
 2)  $g(x)$  and  $j(x)$   
 3)  $f(x)$  and  $h(x)$   
 4)  $f(x)$  and  $j(x)$

175 In a group of 40 people, 20 have brown hair, 22 have blue eyes, and 15 have both brown hair and blue eyes. How many people have neither brown hair nor blue eyes?

- 1) 0  
 2) 13  
 3) 27  
 4) 32

176 The expression  $8^{\frac{x}{2}} \cdot 8^{\frac{x}{3}}$  is equivalent to

- 1)  $\sqrt[6]{8^{5x}}$   
 2)  $64^{\frac{5x}{6}}$   
 3)  $\sqrt[5]{8^{2x}}$   
 4)  $64^{\frac{x^2}{6}}$

177 An initial investment of \$5000 in an account earns 3.5% annual interest. Which function correctly represents a recursive model of the investment after  $n$  years?

- 1)  $A = 5000(0.035)^n$   
 2)  $a_0 = 5000$   
 $a_n = a_{n-1}(0.035)$   
 3)  $A = 5000(1.035)^n$   
 4)  $a_0 = 5000$   
 $a_n = a_{n-1}(1.035)$

Algebra II Multiple Choice Regents Exam Questions

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- 178 Emmeline is working on one side of a polynomial identity proof used to form Pythagorean triples. Her work is shown below:

$$(5x)^2 + (5x^2 - 5)^2$$

Step 1:  $25x^2 + (5x^2 - 5)^2$

Step 2:  $25x^2 + 25x^2 + 25$

Step 3:  $50x^2 + 25$

Step 4:  $75x^2$

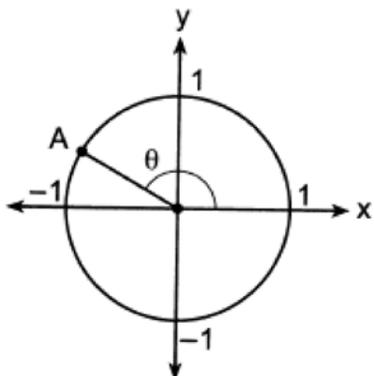
What statement is true regarding Emmeline's work?

- 1) Emmeline's work is entirely correct.
- 2) There is a mistake in step 2, only.
- 3) There are mistakes in step 2 and step 4.
- 4) There is a mistake in step 4, only.

- 179 In the diagram of a unit circle below, point A,

$$\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right),$$

represents the point where the terminal side of  $\theta$  intersects the unit circle.



What is  $m\angle\theta$ ?

- 1)  $30^\circ$
- 2)  $120^\circ$
- 3)  $135^\circ$
- 4)  $150^\circ$

- 180 Which expression is an equivalent form of  $a^5\sqrt{a^4}$ ?

- 1)  $a$
- 2)  $a^{\frac{9}{5}}$
- 3)  $a^{\frac{9}{4}}$
- 4)  $a^{\frac{1}{5}}$

- 181 How many real solutions exist for the system of equations below?

$$y = \frac{1}{4}x - 8$$

$$y = \frac{1}{2}x^2 + 2x$$

- 1) 1
- 2) 2
- 3) 3
- 4) 0

- 182 The expression  $\frac{x^2 + 6}{x^2 + 4}$  is equivalent to

- 1)  $\frac{6}{4}$
- 2)  $1 + \frac{10}{x^2 + 4}$
- 3)  $1 - \frac{2}{x^2 + 4}$
- 4)  $1 + \frac{2}{x^2 + 4}$

- 183 For the polynomial  $p(x)$ , if  $p(3) = 0$ , it can be concluded that

- 1)  $x + 3$  is a factor of  $p(x)$
- 2)  $x - 3$  is a factor of  $p(x)$
- 3) when  $p(x)$  is divided by 3, the remainder is zero
- 4) when  $p(x)$  is divided by  $-3$ , the remainder is zero

- 184 A manufacturer claims that the number of ounces of a beverage dispensed by one of its automatic dispensers is normally distributed with a mean of 8.0 ounces and a standard deviation of 0.04 ounces. To the *nearest tenth of a percent*, what percent of the cups filled by this company's dispenser will contain between 7.9 and 8.11 ounces?

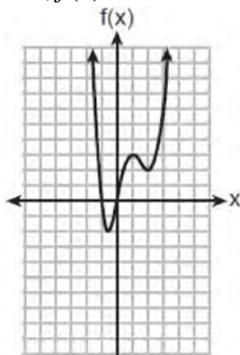
- 1) 99.5
- 2) 99.4
- 3) 99.1
- 4) 97.6



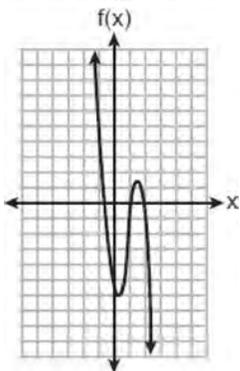
Algebra II Multiple Choice Regents Exam Questions

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- 195 Which function has the characteristic as  $x \rightarrow -\infty, f(x) \rightarrow -\infty$ ?



1)



2)

3)  $f(x) = 5(4)^{-x}$

4)  $f(x) = -\log_5(-x)$

- 196 A teacher randomly divides all of her students into two groups. She grades the homework for one group but does not grade the homework for the other group. All homework is returned to the students. She then compares test scores for each of the groups to see if grading homework has an effect on the tests cores. This method of data collection is best described as

- 1) an experiment
- 2) an unbiased survey
- 3) a simulation
- 4) an observational study

- 197 Given  $f(x) = 2x^2 + 7x - 15$  and  $g(x) = 3 - 2x$ , what is  $\frac{f(x)}{g(x)}$  for all defined values?

- 1)  $-x - 5$
- 2)  $-x + 5$
- 3)  $x - 5$
- 4)  $x + 5$

- 198 A recursive formula for the sequence 64, 48, 36, ... is

1)  $a_n = 64(0.75)^{n-1}$

2)  $a_1 = 64$

$a_n = a_{n-1} - 16$

3)  $a_n = 64 + (n - 1)(-16)$

4)  $a_1 = 64$

$a_n = 0.75a_{n-1}$

- 199 Which statements must be true about the polynomial function  $k(x) = -2x^3 - 11x^2 - 12x + 9$ ?

I.  $(x - 3)$  is a factor of  $k(x)$

II.  $k(0) = 9$

III.  $\frac{k(x)}{x + 2}$  has a remainder of 5

- 1) II, only
- 2) I and II
- 3) II and III
- 4) I, II, and III

- 200 Given  $f(x) = 3^{x-1} + 2$ , as  $x \rightarrow -\infty$

1)  $f(x) \rightarrow -1$

2)  $f(x) \rightarrow 0$

3)  $f(x) \rightarrow 2$

4)  $f(x) \rightarrow -\infty$

- 201 Which situation best describes conditional probability?

- 1) finding the probability of an event occurring two or more times
- 2) finding the probability of an event occurring only once
- 3) finding the probability of two independent events occurring at the same time
- 4) finding the probability of an event occurring given another event had already occurred

- 202 The solution set of  $\frac{x+3}{x-5} + \frac{6}{x+2} = \frac{6+10x}{(x-5)(x+2)}$  is

- 1)  $\{-6\}$
- 2)  $\{5\}$
- 3)  $\{-6, 5\}$
- 4)  $\{-5, 6\}$

- 203 Given  $p \neq q$ ,  $p = \left(\frac{1}{2}\right)^q$ , expressed in logarithmic form, is equivalent to
- 1)  $\log_p\left(\frac{1}{2}\right) = q$
  - 2)  $\log_q(p) = \frac{1}{2}$
  - 3)  $\log_{\frac{1}{2}}(p) = q$
  - 4)  $\log_{\frac{1}{2}}(q) = p$
- 204 Which expression is equivalent to  $\frac{x^3 - 2}{x - 2}$ ?
- 1)  $x^2$
  - 2)  $x^2 + 2x + 4 + \frac{6}{x - 2}$
  - 3)  $x^2 - 2$
  - 4)  $x^2 - 2x + 4 - \frac{10}{x - 2}$
- 205 Which expression is equivalent to  $(x + yi)(x^2 - xyi - y^2)$ , where  $i$  is the imaginary unit?
- 1)  $x^3 + y^3i$
  - 2)  $x^3 - xy^2 - (xy^2 + y^3)i$
  - 3)  $x^3 - 2xy^2 - y^3i$
  - 4)  $x^3 - y^3i$
- 206 The solution set for the equation  $x + 1 = \sqrt{4x + 25}$  is
- 1)  $\{ \}$
  - 2)  $\{6\}$
  - 3)  $\{6, -4\}$
  - 4)  $\{-4\}$
- 207 Which equation is true for all real values of  $x$ ?
- 1)  $x^4 + x = (x + 1)(x^3 - x^2 + x)$
  - 2)  $x^4 + x = (x + 1)(x^3 + x)$
  - 3)  $x^4 + x = (x^2 + x)^2$
  - 4)  $x^4 + x = (x - 1)(x^3 + x^2 + x)$
- 208 Beginning July 1, 2019, Michelle deposited \$250 into an account that yields 0.15% each month. She continued to make \$250 deposits into this account on the first of each month for 3 years. Which expression represents the amount of money that was in the account after her last deposit was made on June 1, 2022?
- 1)  $250(1.0015)^3$
  - 2)  $250(1.0015)^{36}$
  - 3)  $\frac{250 - 250(1.0015)^3}{1 - 1.0015}$
  - 4)  $\frac{250 - 250(1.0015)^{36}}{1 - 1.0015}$
- 209 Which expression is equivalent to  $(x + 2)^2 - 5(x + 2) + 6$ ?
- 1)  $x(x - 1)$
  - 2)  $(x - 3)(x - 2)$
  - 3)  $(x - 4)(x + 3)$
  - 4)  $(x - 6)(x + 1)$
- 210 Functions  $f$  and  $g$  are given below.
- $$f(x) = \frac{7}{2}x^2 - 5x + 11$$
- $$g(x) = 3x^2 - 7x + 25$$
- When  $2f(x)$  is subtracted from  $g(x)$ , the result is
- 1)  $4x^2 - 3x - 3$
  - 2)  $-4x^2 + 3x + 3$
  - 3)  $4x^2 - 17x - 47$
  - 4)  $-4x^2 - 17x + 47$
- 211 Consider a cubic polynomial with the characteristics below.
- exactly one real root
  - as  $x \rightarrow \infty, f(x) \rightarrow -\infty$
- Given  $a > 0$  and  $b > 0$ , which equation represents a cubic polynomial with these characteristics?
- 1)  $f(x) = (x - a)(x^2 + b)$
  - 2)  $f(x) = (a - x)(x^2 + b)$
  - 3)  $f(x) = (a - x^2)(x^2 + b)$
  - 4)  $f(x) = (x - a)(b - x^2)$

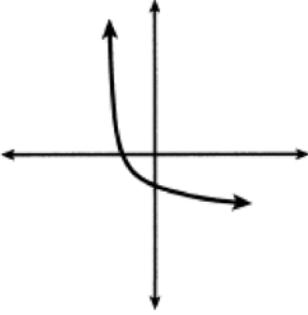
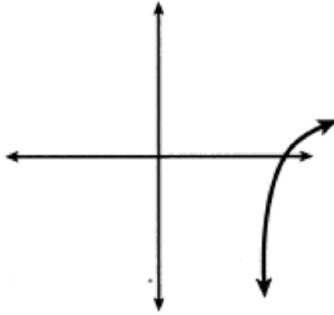
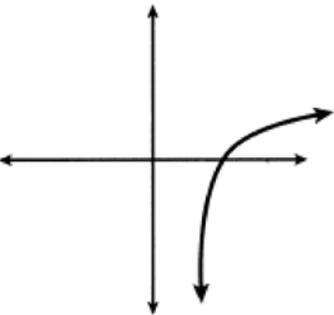
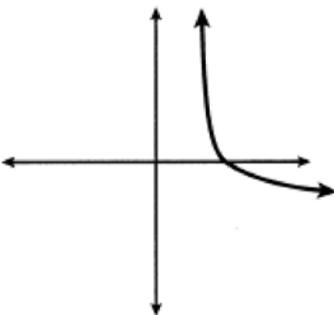
Algebra II Multiple Choice Regents Exam Questions

[www.jmap.org](http://www.jmap.org)

212 A function is defined as  $a_n = a_{n-1} + \log_{n+1}(n-1)$ , where  $a_1 = 8$ . What is the value of  $a_3$ ?

- 1) 8
- 2) 8.5
- 3) 9.2
- 4) 10

213 Which sketch could represent the function  $m(x) = -\log_{100}(x-2)$ ?

- 1) 
- 2) 
- 3) 
- 4) 

214 The rational expression  $\frac{2x^4 - 5x^2 + 3x - 2}{x - 3}$  is equivalent to

- 1)  $2x^3 - 5x - 12 - \frac{38}{x-3}$
- 2)  $2x^3 + 6x^2 + 13x + 42 + \frac{124}{x-3}$
- 3)  $2x^3 - 5x + 18 - \frac{56}{x-3}$
- 4)  $2x^3 - 6x^2 + 13x - 36 + \frac{106}{x-3}$

215 Which equation is equivalent to  $P = 210x^{\frac{4}{3}}y^{\frac{7}{3}}$

- 1)  $P = \sqrt[3]{210x^4y^7}$
- 2)  $P = 70xy^2\sqrt[3]{xy}$
- 3)  $P = 210xy^2\sqrt[3]{xy}$
- 4)  $P = 210xy^2\sqrt[3]{x^3y^5}$

216 For all positive values of  $x$ , which expression is equivalent to  $x^{\frac{3}{4}}$ ?

- 1)  $\sqrt[4]{x^3}$
- 2)  $\sqrt[3]{x^4}$
- 3)  $(x^3)^4$
- 4)  $3(x^4)$

217 Jay is training for a bike race over fifteen weeks. At the end of the first week, he has ridden ten miles, and he is planning to increase his weekly distance by nine percent each week. Approximately how many miles total will he have ridden from the beginning of his training to the end of the fifteenth week?

- 1) 10.989
- 2) 33.417
- 3) 163.5
- 4) 293.609

Algebra II Multiple Choice Regents Exam Questions

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218 If  $f(x) = (x^2 + 3x + 2)(x^2 - 4x + 3)$  and  $g(x) = x^2 - 9$ , then how many real solutions are there to the equation  $f(x) = g(x)$ ?

- 1) 1
- 2) 2
- 3) 6
- 4) 4

219 The solutions to the equation  $3x^2 - 4x + 2 = 2x - 3$  are

- 1)  $\frac{2}{3} \pm \frac{\sqrt{2}}{3}i$
- 2)  $1 \pm \frac{\sqrt{6}}{3}i$
- 3)  $1 \pm \frac{\sqrt{12}}{3}$
- 4)  $1 \pm 2\sqrt{6}i$

220 A retailer advertises that items will be discounted by 10% every Monday until they are sold. In how many weeks will an item costing \$50 first be sold for under half price?

- 1) 7
- 2) 6
- 3) 5
- 4) 4

221 Chet has \$1200 invested in a bank account modeled by the function  $P(n) = 1200(1.002)^n$ , where  $P(n)$  is the value of his account, in dollars, after  $n$  months. Chet's debt is modeled by the function  $Q(n) = 100n$ , where  $Q(n)$  is the value of debt, in dollars, after  $n$  months. After  $n$  months, which function represents Chet's net worth,  $R(n)$ ?

- 1)  $R(n) = 1200(1.002)^n + 100n$
- 2)  $R(n) = 1200(1.002)^{12n} + 100n$
- 3)  $R(n) = 1200(1.002)^n - 100n$
- 4)  $R(n) = 1200(1.002)^{12n} - 100n$

222 What is the solution set of the equation

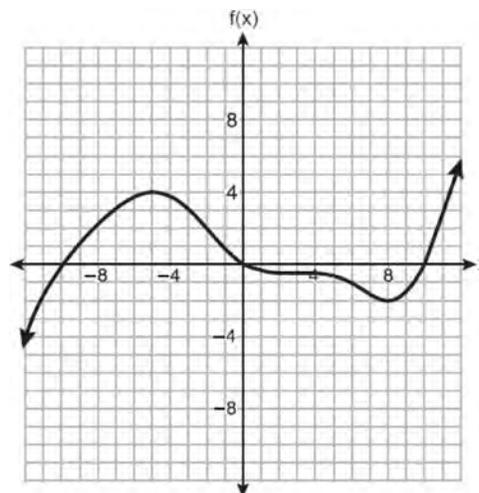
$$\frac{x+2}{x} + \frac{x}{3} = \frac{2x^2+6}{3x}?$$

- 1)  $\{-3\}$
- 2)  $\{-3, 0\}$
- 3)  $\{3\}$
- 4)  $\{0, 3\}$

223 Given the equation  $S(x) = 1.7 \sin(bx) + 12$ , where the period of  $S(x)$  is 12, what is the value of  $b$ ?

- 1)  $\frac{\pi}{6}$
- 2)  $24\pi$
- 3)  $\frac{\pi}{12}$
- 4)  $6\pi$

224 The graph of the function  $f(x)$  is shown below.



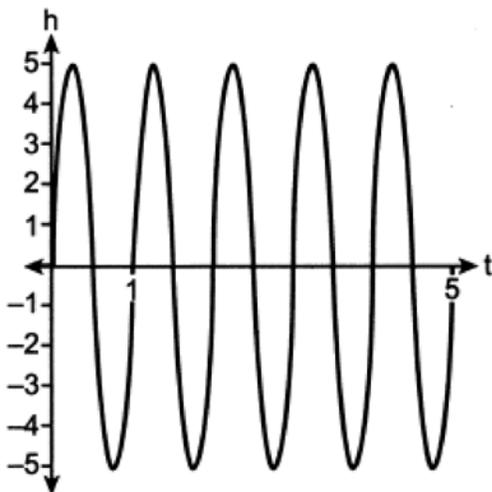
In which interval is  $f(x)$  always positive?

- 1)  $(-2, 4)$
- 2)  $(0, 10)$
- 3)  $(-12, -5)$
- 4)  $(-10, 0)$

225 The parabola with equation  $12(y + 1) = (x - 4)^2$  has

- 1) a vertex at  $(4, 2)$
- 2) a focus at  $(4, -1)$
- 3) a directrix  $y = -4$
- 4) four units between the focus and vertex

- 226 The value of an automobile  $t$  years after it was purchased is given by the function  $V = 38,000(0.84)^t$ . Which statement is true?
- 1) The value of the car increases 84% each year.
  - 2) The value of the car decreases 84% each year.
  - 3) The value of the car increases 16% each year.
  - 4) The value of the car decreases 16% each year.
- 227 A cyclist pedals a bike at a rate of 60 revolutions per minute. The height,  $h$ , of a pedal at time  $t$ , in seconds, is plotted below.



The graph can be modeled by the function  $h(t) = 5 \sin(kt)$ , where  $k$  is equal to

- 1) 1
  - 2)  $2\pi$
  - 3) 60
  - 4)  $\frac{\pi}{30}$
- 228 The depth of the water,  $d(t)$ , in feet, on a given day at Thunder Bay,  $t$  hours after midnight is modeled by  $d(t) = 5 \sin\left(\frac{\pi}{6}(t-5)\right) + 7$ . Which statement about the Thunder Bay tide is *false*?
- 1) A low tide occurred at 2 a.m.
  - 2) The maximum depth of the water was 12 feet.
  - 3) The water depth at 9 a.m. was approximately 11 feet.
  - 4) The difference in water depth between high tide and low tide is 14 feet.

- 229 The probability of having math homework is  $\frac{1}{3}$  and the probability of having English homework is  $\frac{1}{7}$ . The probability of having math homework or having English homework is  $\frac{9}{21}$ . What is the probability of having math homework and having English homework?

- 1)  $\frac{19}{21}$
  - 2)  $\frac{1}{5}$
  - 3)  $\frac{1}{21}$
  - 4)  $\frac{10}{21}$
- 230 Which expression is a factor of  $x^4 - x^3 - 11x^2 + 5x + 30$ ?
- 1)  $x + 2$
  - 2)  $x - 2$
  - 3)  $x + 5$
  - 4)  $x - 5$
- 231 Mr. Zachary posts review assignments on the Betamath website for his students. On his last test, 49% of his students used Betamath and passed. Overall, 68% of his students used Betamath. Approximately what percentage of Mr. Zachary's students passed, given that they used Betamath?
- 1) 19%
  - 2) 32%
  - 3) 33%
  - 4) 72%

- 232 The expression  $(x + a)^2 + 5(x + a) + 4$  is equivalent to
- 1)  $(a + 1)(a + 4)$
  - 2)  $(x + 1)(x + 4)$
  - 3)  $(x + a + 1)(x + a + 4)$
  - 4)  $x^2 + a^2 + 5x + 5a + 4$

Algebra II Multiple Choice Regents Exam Questions

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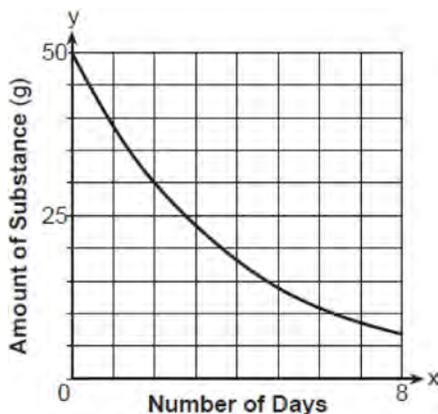
233 A company wishes to determine the cooking time for one pound of spaghetti. The company's technicians cooked one pound of spaghetti and recorded the time needed for the spaghetti to be ready to eat. Repeating this process 35 times resulted in an approximately normal distribution, with a mean of 9.82 minutes and a standard deviation of 1.4 minutes. In which interval should the middle 95% of cooking times fall?

- 1) (8.42, 11.22)
- 2) (7.02, 12.62)
- 3) (9.35, 10.29)
- 4) (6.82, 11.32)

234 Which equation has roots of  $3 + i$  and  $3 - i$ ?

- 1)  $x^2 - 6x + 10 = 0$
- 2)  $x^2 + 6x - 10 = 0$
- 3)  $x^2 - 10x + 6 = 0$
- 4)  $x^2 + 10x - 6 = 0$

235 The graph below shows the amount of a radioactive substance left over time.



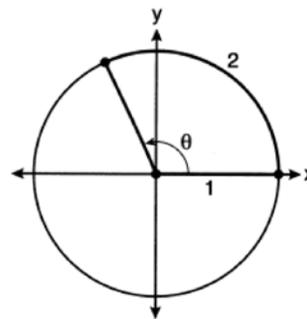
The daily rate of decay over an 8-day interval is approximately

- 1) 23%
- 2) 95%
- 3) 5%
- 4) 77%

236 The expression  $\sqrt[4]{81x^8y^6}$  is equivalent to

- 1)  $3x^2y^{\frac{3}{2}}$
- 2)  $3x^4y^2$
- 3)  $9x^2y^{\frac{3}{2}}$
- 4)  $9x^4y^2$

237 An angle,  $\theta$ , is rotated counterclockwise on the unit circle, with its terminal side in the second quadrant, as shown in the diagram below.



Which value represents the radian measure of angle  $\theta$ ?

- 1) 1
- 2) 2
- 3) 65.4
- 4) 114.6

238 Given  $q(x) = 2 \log(x)$  and  $r(x) = (x - 2)^3 - 4$ , what is a solution of  $q(x) = r(x)$  to the nearest tenth?

- 1) 1.1
- 2) 3.7
- 3) 3.9
- 4) 4.3

239 What are the zeros of

$$s(x) = x^4 - 9x^2 + 3x^3 - 27x - 10x^2 + 90?$$

- 1)  $\{-3, -2, 5\}$
- 2)  $\{-2, 3, 5\}$
- 3)  $\{-3, -2, 3, 5\}$
- 4)  $\{-5, -3, 2, 3\}$

**Algebra II Multiple Choice Regents Exam Questions**

- 240 The populations of two small towns at the beginning of 2018 and their annual population growth rate are shown in the table below.

| Town         | Population | Annual Population Growth Rate |
|--------------|------------|-------------------------------|
| Jonesville   | 1240       | 6% increase                   |
| Williamstown | 890        | 11% increase                  |

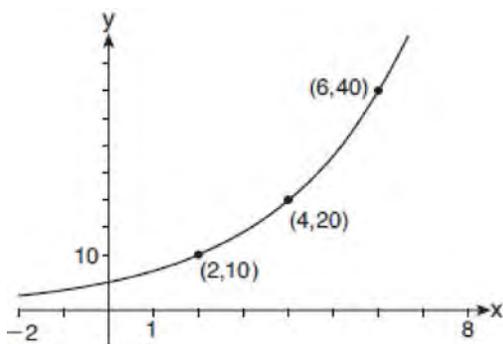
Assuming the trend continues, approximately how many years after the beginning of 2018 will it take for the populations to be equal?

- 1) 7  
2) 20  
3) 68  
4) 125
- 241 On average, college seniors graduating in 2012 could compute their growing student loan debt using the function  $D(t) = 29,400(1.068)^t$ , where  $t$  is time in years. Which expression is equivalent to  $29,400(1.068)^t$  and could be used by students to identify an approximate daily interest rate on their loans?
- 1)  $29,400 \left( 1.068^{\frac{1}{365}} \right)^t$   
2)  $29,400 \left( \frac{1.068}{365} \right)^{365t}$   
3)  $29,400 \left( 1 + \frac{0.068}{365} \right)^t$   
4)  $29,400 \left( 1.068^{\frac{1}{365}} \right)^{365t}$
- 242 Which statement is true about the graph of  $f(x) = \left( \frac{1}{8} \right)^x$ ?
- 1) The graph is always increasing.  
2) The graph is always decreasing.  
3) The graph passes through (1,0).  
4) The graph has an asymptote,  $x = 0$ .
- 243 The graph of  $y = \log_2 x$  is translated to the right 1 unit and down 1 unit. The coordinates of the  $x$ -intercept of the translated graph are
- 1) (0,0)  
2) (1,0)  
3) (2,0)  
4) (3,0)
- 244 Perry invested in property that cost him \$1500. Five years later it was worth \$3000, and 10 years from his original purchase, it was worth \$6000. Assuming the growth rate remains the same, which type of function could he create to find the value of his investment 30 years from his original purchase?
- 1) exponential function  
2) linear function  
3) quadratic function  
4) trigonometric function
- 245 If  $f(x)$  is an even function, which function must also be even?
- 1)  $f(x - 2)$   
2)  $f(x) + 3$   
3)  $f(x + 1)$   
4)  $f(x + 1) + 3$

- 246 The weights of bags of Graseck's Chocolate Candies are normally distributed with a mean of 4.3 ounces and a standard deviation of 0.05 ounces. What is the probability that a bag of these chocolate candies weighs less than 4.27 ounces?
- 0.2257
  - 0.2743
  - 0.7257
  - 0.7757
- 247 For a given time,  $x$ , in seconds, an electric current,  $y$ , can be represented by  $y = 2.5(1 - 2.7^{-10x})$ . Which equation is *not* equivalent?
- $y = 2.5 - 2.5(2.7^{-10x})$
  - $y = 2.5 - 2.5\left((2.7^2)^{-0.05x}\right)$
  - $y = 2.5 - 2.5\left(\frac{1}{2.7^{10x}}\right)$
  - $y = 2.5 - 2.5(2.7^{-2})\left(2.7^{0.05x}\right)$
- 248 Which equation represents the equation of the parabola with focus  $(-3,3)$  and directrix  $y = 7$ ?
- $y = \frac{1}{8}(x+3)^2 - 5$
  - $y = \frac{1}{8}(x-3)^2 + 5$
  - $y = -\frac{1}{8}(x+3)^2 + 5$
  - $y = -\frac{1}{8}(x-3)^2 + 5$
- 249 If  $ae^{bt} = c$ , where  $a$ ,  $b$ , and  $c$  are positive, then  $t$  equals
- $\ln\left(\frac{c}{ab}\right)$
  - $\ln\left(\frac{cb}{a}\right)$
  - $\frac{\ln\left(\frac{c}{a}\right)}{b}$
  - $\frac{\ln\left(\frac{c}{a}\right)}{\ln b}$
- 250 Given  $P(x) = x^3 - 3x^2 - 2x + 4$ , which statement is true?
- $(x-1)$  is a factor because  $P(-1) = 2$ .
  - $(x+1)$  is a factor because  $P(-1) = 2$ .
  - $(x+1)$  is a factor because  $P(1) = 0$ .
  - $(x-1)$  is a factor because  $P(1) = 0$ .
- 251 Brian deposited 1 cent into an empty non-interest bearing bank account on the first day of the month. He then additionally deposited 3 cents on the second day, 9 cents on the third day, and 27 cents on the fourth day. What would be the total amount of money in the account at the end of the 20th day if the pattern continued?
- \$11,622,614.67
  - \$17,433,922.00
  - \$116,226,146.80
  - \$1,743,392,200.00
- 252 Which expression is equivalent to  $x^6y^4(x^4 - 16) - 9(x^4 - 16)$ ?
- $x^{10}y^4 - 16x^6y^4 - 9x^4 - 144$
  - $(x^6y^4 - 9)(x+2)^3(x-2)$
  - $(x^3y^2 + 3)(x^3y^2 - 3)(x+2)^2(x-2)^2$
  - $(x^3y^2 + 3)(x^3y^2 - 3)(x^2 + 4)(x^2 - 4)$
- 253 Consider the probability statements regarding events  $A$  and  $B$  below.
- $$P(A \text{ or } B) = 0.3;$$
- $$P(A \text{ and } B) = 0.2; \text{ and}$$
- $$P(A|B) = 0.8$$
- What is  $P(B)$ ?
- 0.1
  - 0.25
  - 0.375
  - 0.667
- 254 Given the following polynomials
- $$x = (a + b + c)^2$$
- $$y = a^2 + b^2 + c^2$$
- $$z = ab + bc + ac$$
- Which identity is true?
- $x = y - z$
  - $x = y + z$
  - $x = y - 2z$
  - $x = y + 2z$

- 255 Which description could represent the graph of  $f(x) = 4x^2(x + a) - x - a$ , if  $a$  is an integer?
- 1) As  $x \rightarrow -\infty, f(x) \rightarrow \infty$ , as  $x \rightarrow \infty, f(x) \rightarrow \infty$ , and the graph has 3  $x$ -intercepts.
  - 2) As  $x \rightarrow -\infty, f(x) \rightarrow -\infty$ , as  $x \rightarrow \infty, f(x) \rightarrow \infty$ , and the graph has 3  $x$ -intercepts.
  - 3) As  $x \rightarrow -\infty, f(x) \rightarrow \infty$ , as  $x \rightarrow \infty, f(x) \rightarrow -\infty$ , and the graph has 4  $x$ -intercepts.
  - 4) As  $x \rightarrow -\infty, f(x) \rightarrow -\infty$ , as  $x \rightarrow \infty, f(x) \rightarrow \infty$ , and the graph has 4  $x$ -intercepts.

256 The graph of  $y = f(x)$  is shown below.



Which expression defines  $f(x)$ ?

- 1)  $2x$
  - 2)  $5(2^x)$
  - 3)  $5(2^{\frac{x}{2}})$
  - 4)  $5(2^{2x})$
- 257 Stephanie found that the number of white-winged cross bills in an area can be represented by the formula  $C = 550(1.08)^t$ , where  $t$  represents the number of years since 2010. Which equation correctly represents the number of white-winged cross bills in terms of the monthly rate of population growth?
- 1)  $C = 550(1.00643)^t$
  - 2)  $C = 550(1.00643)^{12t}$
  - 3)  $C = 550(1.00643)^{\frac{t}{12}}$
  - 4)  $C = 550(1.00643)^{t+12}$

258 A manufacturing plant produces two different-sized containers of peanuts. One container weighs  $x$  ounces and the other weighs  $y$  pounds. If a gift set can hold one of each size container, which expression represents the number of gift sets needed to hold 124 ounces?

- 1)  $\frac{124}{16x + y}$
- 2)  $\frac{x + 16y}{124}$
- 3)  $\frac{124}{x + 16y}$
- 4)  $\frac{16x + y}{124}$

259 A veterinary pharmaceutical company plans to test a new drug to treat a common intestinal infection among puppies. The puppies are randomly assigned to two equal groups. Half of the puppies will receive the drug, and the other half will receive a placebo. The veterinarians monitor the puppies. This is an example of which study method?

- 1) census
- 2) observational study
- 3) survey
- 4) controlled experiment

260 Camryn puts \$400 into a savings account that earns 6% annually. The amount in her account can be modeled by  $C(t) = 400(1.06)^t$  where  $t$  is the time in years. Which expression best approximates the amount of money in her account using a weekly growth rate?

- 1)  $400(1.001153846)^t$
- 2)  $400(1.001121184)^t$
- 3)  $400(1.001153846)^{52t}$
- 4)  $400(1.001121184)^{52t}$

261 What is the solution set for  $x$  in the equation below?

$$\sqrt{x+1} - 1 = x$$

- 1)  $\{1\}$
- 2)  $\{0\}$
- 3)  $\{-1, 0\}$
- 4)  $\{0, 1\}$

Algebra II Multiple Choice Regents Exam Questions

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262 The mean intelligence quotient (IQ) score is 100, with a standard deviation of 15, and the scores are normally distributed. Given this information, the approximate percentage of the population with an IQ greater than 130 is closest to

- 1) 2%
- 2) 31%
- 3) 48%
- 4) 95%

263 Which table best represents an exponential relationship?

1) 

| x | y             |
|---|---------------|
| 1 | 8             |
| 2 | 4             |
| 3 | 2             |
| 4 | 1             |
| 5 | $\frac{1}{2}$ |

2) 

| x  | y |
|----|---|
| 8  | 0 |
| 4  | 1 |
| 0  | 2 |
| -4 | 3 |
| -8 | 4 |

3) 

| x | y  |
|---|----|
| 0 | 0  |
| 1 | 1  |
| 2 | 4  |
| 3 | 9  |
| 4 | 16 |

4) 

| x | y   |
|---|-----|
| 1 | 1   |
| 2 | 8   |
| 3 | 27  |
| 4 | 64  |
| 5 | 125 |

264 What is the inverse of  $f(x) = x^3 - 2$ ?

- 1)  $f^{-1}(x) = \sqrt[3]{x} + 2$
- 2)  $f^{-1}(x) = \pm\sqrt[3]{x} + 2$
- 3)  $f^{-1}(x) = \sqrt[3]{x+2}$
- 4)  $f^{-1}(x) = \pm\sqrt[3]{x+2}$

265 The value(s) of  $x$  that satisfy

$$\sqrt{x^2 - 4x - 5} = 2x - 10$$

- 1) {5}
- 2) {7}
- 3) {5, 7}
- 4) {3, 5, 7}

266 The half-life of iodine-131 is 8 days. The percent of the isotope left in the body  $d$  days after being

introduced is  $I = 100\left(\frac{1}{2}\right)^{\frac{d}{8}}$ . When this equation is

written in terms of the number  $e$ , the base of the natural logarithm, it is equivalent to  $I = 100e^{kd}$ . What is the approximate value of the constant,  $k$ ?

- 1) -0.087
- 2) 0.087
- 3) -11.542
- 4) 11.542

267 What is the inverse of the function  $y = 4x + 5$ ?

- 1)  $x = \frac{1}{4}y - \frac{5}{4}$
- 2)  $y = \frac{1}{4}x - \frac{5}{4}$
- 3)  $y = 4x - 5$
- 4)  $y = \frac{1}{4x+5}$

268 How many solutions exist for

$$\frac{1}{1-x^2} = -|3x-2| + 5?$$

- 1) 1
- 2) 2
- 3) 3
- 4) 4

Algebra II Multiple Choice Regents Exam Questions

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- 269 If  $(a^3 + 27) = (a + 3)(a^2 + ma + 9)$ , then  $m$  equals
- 1)  $-9$
  - 2)  $-3$
  - 3)  $3$
  - 4)  $6$
- 270 Consider the system of equations below:
- $$x + y - z = 6$$
- $$2x - 3y + 2z = -19$$
- $$-x + 4y - z = 17$$
- Which number is *not* the value of any variable in the solution of the system?
- 1)  $-1$
  - 2)  $2$
  - 3)  $3$
  - 4)  $-4$
- 271 A study of black bears in the Adirondacks reveals that their population can be represented by the function  $P(t) = 3500(1.025)^t$ , where  $t$  is the number of years since the study began. Which function is correctly rewritten to reveal the monthly growth rate of the black bear population?
- 1)  $P(t) = 3500(1.00206)^{12t}$
  - 2)  $P(t) = 3500(1.00206)^{\frac{t}{12}}$
  - 3)  $P(t) = 3500(1.34489)^{12t}$
  - 4)  $P(t) = 3500(1.34489)^{\frac{t}{12}}$
- 272 Given  $\cos \theta = \frac{7}{25}$ , where  $\theta$  is an angle in standard position terminating in quadrant IV, and  $\sin^2 \theta + \cos^2 \theta = 1$ , what is the value of  $\tan \theta$ ?
- 1)  $-\frac{24}{25}$
  - 2)  $-\frac{24}{7}$
  - 3)  $\frac{24}{25}$
  - 4)  $\frac{24}{7}$
- 273 What is the solution when the equation  $wx^2 + w = 0$  is solved for  $x$ , where  $w$  is a positive integer?
- 1)  $-1$
  - 2)  $0$
  - 3)  $6$
  - 4)  $\pm i$
- 274 Suppose two sets of test scores have the same mean, but different standard deviations,  $\sigma_1$  and  $\sigma_2$ , with  $\sigma_2 > \sigma_1$ . Which statement best describes the variability of these data sets?
- 1) Data set one has the greater variability.
  - 2) Data set two has the greater variability.
  - 3) The variability will be the same for each data set.
  - 4) No conclusion can be made regarding the variability of either set.
- 275 The terminal side of  $\theta$ , an angle in standard position, intersects the unit circle at  $P\left(-\frac{1}{3}, -\frac{\sqrt{8}}{3}\right)$ .
- What is the value of  $\sec \theta$ ?
- 1)  $-3$
  - 2)  $-\frac{3\sqrt{8}}{8}$
  - 3)  $-\frac{1}{3}$
  - 4)  $-\frac{\sqrt{8}}{3}$
- 276 A fast-food restaurant analyzes data to better serve its customers. After its analysis, it discovers that the events  $D$ , that a customer uses the drive-thru, and  $F$ , that a customer orders French fries, are independent. The following data are given in a report:
- $$P(F) = 0.8$$
- $$P(F \cap D) = 0.456$$
- Given this information,  $P(F|D)$  is
- 1)  $0.344$
  - 2)  $0.3648$
  - 3)  $0.57$
  - 4)  $0.8$

Algebra II Multiple Choice Regents Exam Questions

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- 277 For which values of  $x$ , rounded to the *nearest hundredth*, will  $|x^2 - 9| - 3 = \log_3 x$ ?
- 1) 2.29 and 3.63
  - 2) 2.37 and 3.54
  - 3) 2.84 and 3.17
  - 4) 2.92 and 3.06
- 278 Judith puts \$5000 into an investment account with interest compounded continuously. Which approximate annual rate is needed for the account to grow to \$9110 after 30 years?
- 1) 2%
  - 2) 2.2%
  - 3) 0.02%
  - 4) 0.022%
- 279 The first term of a geometric sequence is 8 and the fourth term is 216. What is the sum of the first 12 terms of the corresponding series?
- 1) 236,192
  - 2) 708,584
  - 3) 2,125,760
  - 4) 6,377,288
- 280 A number, minus twenty times its reciprocal, equals eight. The number is
- 1) 10 or  $-2$
  - 2) 10 or 2
  - 3)  $-10$  or  $-2$
  - 4)  $-10$  or 2
- 281 Which expression is equivalent to  $\frac{2x^4 + 8x^3 - 25x^2 - 6x + 14}{x + 6}$ ?
- 1)  $2x^3 + 4x^2 + x - 12 + \frac{86}{x + 6}$
  - 2)  $2x^3 - 4x^2 - x + 14$
  - 3)  $2x^3 - 4x^2 - x + \frac{14}{x + 6}$
  - 4)  $2x^3 - 4x^2 - x$
- 282 The graphs of the equations  $y = x^2 + 4x - 1$  and  $y + 3 = x$  are drawn on the same set of axes. One solution of this system is
- 1)  $(-5, -2)$
  - 2)  $(-1, -4)$
  - 3)  $(1, 4)$
  - 4)  $(-2, -1)$
- 283 The expression  $\frac{9x^2 - 2}{3x + 1}$  is equivalent to
- 1)  $3x - 1 - \frac{1}{3x + 1}$
  - 2)  $3x - 1 + \frac{1}{3x + 1}$
  - 3)  $3x + 1 - \frac{1}{3x + 1}$
  - 4)  $3x + 1 + \frac{1}{3x + 1}$
- 284 Tides are a periodic rise and fall of ocean water. On a typical day at a seaport, to predict the time of the next high tide, the most important value to have would be the
- 1) time between consecutive low tides
  - 2) time when the tide height is 20 feet
  - 3) average depth of water over a 24-hour period
  - 4) difference between the water heights at low and high tide
- 285 If the function  $g(x) = ab^x$  represents exponential growth, which statement about  $g(x)$  is *false*?
- 1)  $a > 0$  and  $b > 1$
  - 2) The  $y$ -intercept is  $(0, a)$ .
  - 3) The asymptote is  $y = 0$ .
  - 4) The  $x$ -intercept is  $(b, 0)$ .
- 286 Which expression is equivalent to  $(2x - i)^2 - (2x - i)(2x + 3i)$  where  $i$  is the imaginary unit and  $x$  is a real number?
- 1)  $-4 - 8xi$
  - 2)  $-4 - 4xi$
  - 3) 2
  - 4)  $8x - 4i$

Algebra II Multiple Choice Regents Exam Questions

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- 287 Jake wants to buy a car and hopes to save at least \$5000 for a down payment. The table below summarizes the amount of money he plans to save each week.

| Week                    | 1 | 2 | 3    | 4     | 5   |
|-------------------------|---|---|------|-------|-----|
| Money Saved, in Dollars | 2 | 5 | 12.5 | 31.25 | ... |

Based on this plan, which expression should he use to determine how much he has saved in  $n$  weeks?

- 1)  $\frac{2 - 2(2.5^n)}{1 - 2.5}$       3)  $\frac{1 - 2.5^n}{1 - 2.5}$   
 2)  $\frac{2 - 2(2.5^{n-1})}{1 - 2.5}$       4)  $\frac{1 - 2.5^{n-1}}{1 - 2.5}$
- 288 Which function's graph has a period of 8 and reaches a maximum height of 1 if at least one full period is graphed?
- 291 The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.

- 1)  $y = -4 \cos\left(\frac{\pi}{4}x\right) - 3$   
 2)  $y = -4 \cos\left(\frac{\pi}{4}x\right) + 5$   
 3)  $y = -4 \cos(8x) - 3$   
 4)  $y = -4 \cos(8x) + 5$

- 289 Which statement(s) are true for all real numbers?

I  $(x - y)^2 = x^2 + y^2$   
 II  $(x + y)^3 = x^3 + 3xy + y^3$

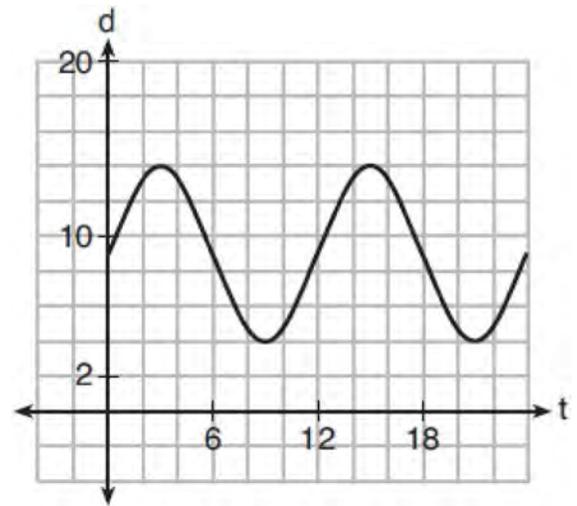
- 1) I, only  
 2) II, only  
 3) I and II  
 4) neither I nor II

- 290 What is the solution set of the following system of equations?

$$y = 3x + 6$$

$$y = (x + 4)^2 - 10$$

- 1)  $\{(-5, -9)\}$   
 2)  $\{(5, 21)\}$   
 3)  $\{(0, 6), (-5, -9)\}$   
 4)  $\{(0, 6), (5, 21)\}$



If the depth,  $d$ , is measured in feet and time,  $t$ , is measured in hours since midnight, what is an equation for the depth of the water at the marker?

- 1)  $d = 5 \cos\left(\frac{\pi}{6}t\right) + 9$   
 2)  $d = 9 \cos\left(\frac{\pi}{6}t\right) + 5$   
 3)  $d = 9 \sin\left(\frac{\pi}{6}t\right) + 5$   
 4)  $d = 5 \sin\left(\frac{\pi}{6}t\right) + 9$

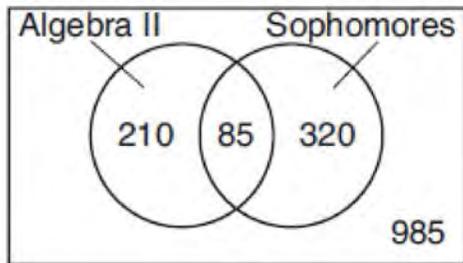
Algebra II Multiple Choice Regents Exam Questions

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292 What is the equation of the directrix for the parabola  $-8(y - 3) = (x + 4)^2$ ?

- 1)  $y = 5$
- 2)  $y = 1$
- 3)  $y = -2$
- 4)  $y = -6$

293 Data for the students enrolled in a local high school are shown in the Venn diagram below.



If a student from the high school is selected at random, what is the probability that the student is a sophomore given that the student is enrolled in Algebra II?

- 1)  $\frac{85}{210}$
- 2)  $\frac{85}{295}$
- 3)  $\frac{85}{405}$
- 4)  $\frac{85}{1600}$

294 Julia deposits \$2000 into a savings account that earns 4% interest per year. The exponential function that models this savings account is  $y = 2000(1.04)^t$ , where  $t$  is the time in years. Which equation correctly represents the amount of money in her savings account in terms of the monthly growth rate?

- 1)  $y = 166.67(1.04)^{0.12t}$
- 2)  $y = 2000(1.01)^t$
- 3)  $y = 2000(1.0032737)^{12t}$
- 4)  $y = 166.67(1.0032737)^t$

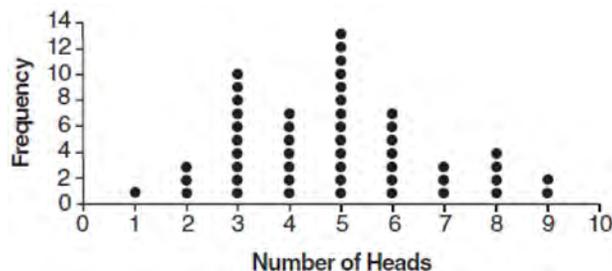
295 The Fahrenheit temperature,  $F(t)$ , of a heated object at time  $t$ , in minutes, can be modeled by the function below.  $F_s$  is the surrounding temperature,  $F_0$  is the initial temperature of the object, and  $k$  is a constant.

$$F(t) = F_s + (F_0 - F_s)e^{-kt}$$

Coffee at a temperature of  $195^\circ\text{F}$  is poured into a container. The room temperature is kept at a constant  $68^\circ\text{F}$  and  $k = 0.05$ . Coffee is safe to drink when its temperature is, at most,  $120^\circ\text{F}$ . To the nearest minute, how long will it take until the coffee is safe to drink?

- 1) 7
- 2) 10
- 3) 11
- 4) 18

296 The results of simulating tossing a coin 10 times, recording the number of heads, and repeating this 50 times are shown in the graph below.



Based on the results of the simulation, which statement is *false*?

- 1) Five heads occurred most often, which is consistent with the theoretical probability of obtaining a heads.
- 2) Eight heads is unusual, as it falls outside the middle 95% of the data.
- 3) Obtaining three heads or fewer occurred 28% of the time.
- 4) Seven heads is not unusual, as it falls within the middle 95% of the data.

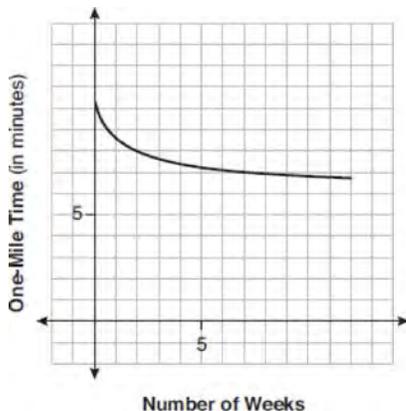
297 Selected values for the functions  $f$  and  $g$  are shown in the tables below.

| $x$   | $f(x)$ |  | $x$   | $g(x)$ |
|-------|--------|--|-------|--------|
| -3.12 | -4.88  |  | -2.01 | -1.01  |
| 0     | -6     |  | 0     | 0.58   |
| 1.23  | -4.77  |  | 8.52  | 2.53   |
| 8.52  | 2.53   |  | 13.11 | 3.01   |
| 9.01  | 3.01   |  | 16.52 | 3.29   |

A solution to the equation  $f(x) = g(x)$  is

- 1) 0
- 2) 2.53
- 3) 3.01
- 4) 8.52

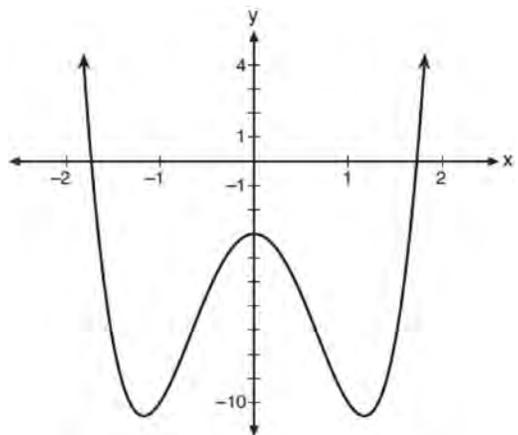
298 Irma initially ran one mile in over ten minutes. She then began a training program to reduce her one-mile time. She recorded her one-mile time once a week for twelve consecutive weeks, as modeled in the graph below.



Which statement regarding Irma's one-mile training program is correct?

- 1) Her one-mile speed increased as the number of weeks increased.
- 2) Her one-mile speed decreased as the number of weeks increased.
- 3) If the trend continues, she will run under a six-minute mile by week thirteen.
- 4) She reduced her one-mile time the most between weeks ten and twelve.

299 Consider the function  $p(x) = 3x^3 + x^2 - 5x$  and the graph of  $y = m(x)$  below.



Which statement is true?

- 1)  $p(x)$  has three real roots and  $m(x)$  has two real roots.
- 2)  $p(x)$  has one real root and  $m(x)$  has two real roots.
- 3)  $p(x)$  has two real roots and  $m(x)$  has three real roots.
- 4)  $p(x)$  has three real roots and  $m(x)$  has four real roots.

300 Which expression(s) are equivalent to  $\frac{x^2 - 4x}{2x}$ ,

where  $x \neq 0$ ?

I.  $\frac{x}{2} - 2$     II.  $\frac{x-4}{2}$     III.  $\frac{x-1}{2} - \frac{3}{2}$

- 1) II, only
- 2) I and II
- 3) II and III
- 4) I, II, and III

301 When factoring to reveal the roots of the equation  $x^3 + 2x^2 - 9x - 18 = 0$ , which equations can be used?

I.  $x^2(x+2) - 9(x+2) = 0$   
 II.  $x(x^2 - 9) + 2(x^2 - 9) = 0$   
 III.  $(x-2)(x^2 - 9) = 0$

- 1) I and II, only
- 2) I and III, only
- 3) II and III, only
- 4) I, II, and III

302 If  $f(x) = a^x$  where  $a > 1$ , then the inverse of the function is

- 1)  $f^{-1}(x) = \log_x a$
- 2)  $f^{-1}(x) = a \log x$
- 3)  $f^{-1}(x) = \log_a x$
- 4)  $f^{-1}(x) = x \log a$

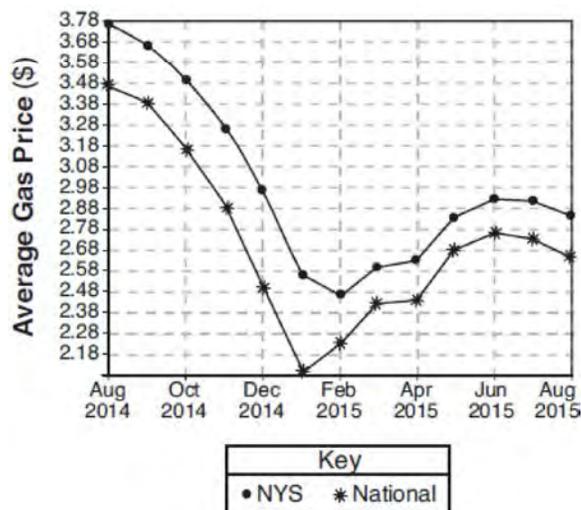
303 Given  $y > 0$ , the expression  $\sqrt{3x^2y} \cdot \sqrt[3]{27x^3y^2}$  is equivalent to

- 1)  $81x^5y^3$
- 2)  $3^{1.5}x^2y$
- 3)  $3^{\frac{5}{2}}x^2y^{\frac{5}{3}}$
- 4)  $3^{\frac{3}{2}}x^2y^{\frac{7}{6}}$

304 The operator of the local mall wants to find out how many of the mall's employees make purchases in the food court when they are working. She hopes to use these data to increase the rent and attract new food vendors. In total, there are 1023 employees who work at the mall. The best method to obtain a random sample of the employees would be to survey

- 1) all 170 employees at each of the larger stores
- 2) 50% of the 90 employees of the food court
- 3) every employee
- 4) every 30th employee entering each mall entrance for one week

305 The graph below represents national and New York State average gas prices.



If New York State's gas prices are modeled by  $G(x)$  and  $C > 0$ , which expression best approximates the national average  $x$  months from August 2014?

- 1)  $G(x + C)$
- 2)  $G(x) + C$
- 3)  $G(x - C)$
- 4)  $G(x) - C$

Algebra II Multiple Choice Regents Exam Questions

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- 306 An estimate of the number of milligrams of a medication in the bloodstream  $t$  hours after 400 mg has been taken can be modeled by the function below.

$$I(t) = 0.5t^4 + 3.45t^3 - 96.65t^2 + 347.7t,$$

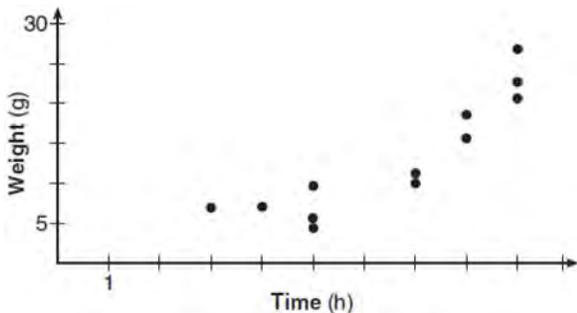
where  $0 \leq t \leq 6$

Over what time interval does the amount of medication in the bloodstream strictly increase?

- 1) 0 to 2 hours
  - 2) 0 to 3 hours
  - 3) 2 to 6 hours
  - 4) 3 to 6 hours
- 307 For positive values of  $x$ , which expression is

equivalent to  $\sqrt{16x^2} \cdot x^{\frac{2}{3}} + \sqrt[3]{8x^5}$

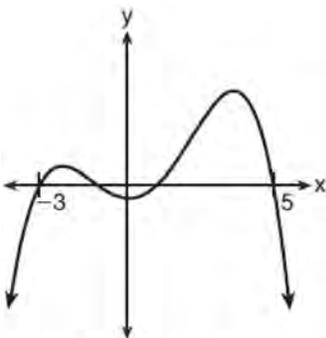
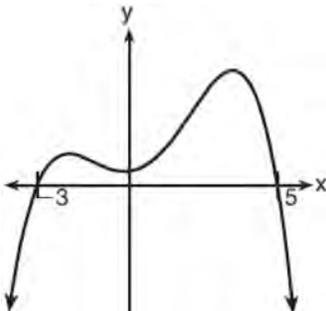
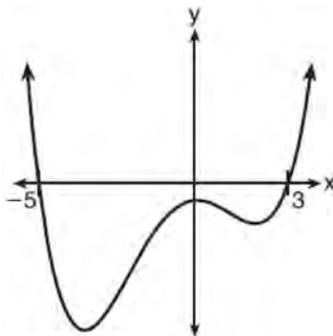
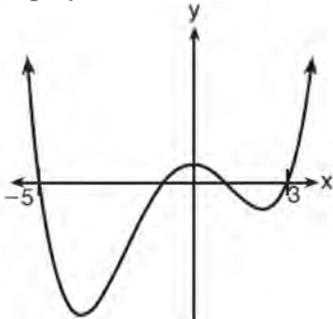
- 1)  $6^5\sqrt{x^3}$
  - 2)  $6^3\sqrt{x^5}$
  - 3)  $4^3\sqrt{x^2} + 2^3\sqrt{x^5}$
  - 4)  $4\sqrt{x^3} + 2^5\sqrt{x^3}$
- 308 A scatterplot showing the weight,  $w$ , in grams, of each crystal after growing  $t$  hours is shown below.



The relationship between weight,  $w$ , and time,  $t$ , is best modeled by

- 1)  $w = 4^t + 5$
  - 2)  $w = (1.4)^t + 2$
  - 3)  $w = 5(2.1)^t$
  - 4)  $w = 8(.75)^t$
- 309 The parabola described by the equation  $y = \frac{1}{12}(x - 2)^2 + 2$  has the directrix at  $y = -1$ . The focus of the parabola is
- 1) (2, -1)
  - 2) (2, 2)
  - 3) (2, 3)
  - 4) (2, 5)
- 310 There are 400 students in the senior class at Oak Creek High School. All of these students took the SAT. The distribution of their SAT scores is approximately normal. The number of students who scored within 2 standard deviations of the mean is approximately
- 1) 75
  - 2) 95
  - 3) 300
  - 4) 380
- 311 A sociologist reviews randomly selected surveillance videos from a public park over a period of several years and records the amount of time people spent on a smartphone. The statistical procedure the sociologist used is called
- 1) a census
  - 2) an experiment
  - 3) an observational study
  - 4) a sample survey
- 312 If \$5000 is put into a savings account that pays 3.5% interest compounded monthly, how much money, to the nearest ten cents, would be in that account after 6 years, assuming no money was added or withdrawn?
- 1) \$5177.80
  - 2) \$5941.30
  - 3) \$6146.30
  - 4) \$6166.50
- 313 Given  $c(m) = m^3 - 2m^2 + 4m - 8$ , the solution of  $c(m) = 0$  is
- 1)  $\pm 2$
  - 2) 2, only
  - 3)  $2i, 2$
  - 4)  $\pm 2i, 2$

- 314 A 4th degree polynomial has zeros  $-5$ ,  $3$ ,  $i$ , and  $-i$ . Which graph could represent the function defined by this polynomial?



- 315 What is the solution set of the equation

$$\frac{2}{x} - \frac{3x}{x+3} = \frac{x}{x+3}?$$

- 1)  $\{3\}$   
 2)  $\left\{\frac{3}{2}\right\}$   
 3)  $\{-2, 3\}$   
 4)  $\left\{-1, \frac{3}{2}\right\}$
- 316 What is the quotient when  $10x^3 - 3x^2 - 7x + 3$  is divided by  $2x - 1$ ?
- 1)  $5x^2 + x + 3$   
 2)  $5x^2 - x + 3$   
 3)  $5x^2 - x - 3$   
 4)  $5x^2 + x - 3$
- 317 A savings account,  $S$ , has an initial value of \$50. The account grows at a 2% interest rate compounded  $n$  times per year,  $t$ , according to the function below.

$$S(t) = 50 \left( 1 + \frac{.02}{n} \right)^{nt}$$

Which statement about the account is correct?

- 1) As the value of  $n$  increases, the amount of interest per year decreases.  
 2) As the value of  $n$  increases, the value of the account approaches the function  $S(t) = 50e^{0.02t}$ .  
 3) As the value of  $n$  decreases to one, the amount of interest per year increases.  
 4) As the value of  $n$  decreases to one, the value of the account approaches the function  $S(t) = 50(1 - 0.02)^t$ .
- 318 Which equation represents a parabola with a focus of  $(-2, 5)$  and a directrix of  $y = 9$ ?
- 1)  $(y - 7)^2 = 8(x + 2)$   
 2)  $(y - 7)^2 = -8(x + 2)$   
 3)  $(x + 2)^2 = 8(y - 7)$   
 4)  $(x + 2)^2 = -8(y - 7)$

Algebra II Multiple Choice Regents Exam Questions

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- 319 After Roger’s surgery, his doctor administered pain medication in the following amounts in milligrams over four days.

| Day (n)    | 1    | 2    | 3      | 4      |
|------------|------|------|--------|--------|
| Dosage (m) | 2000 | 1680 | 1411.2 | 1185.4 |

How can this sequence best be modeled recursively?

- 1)  $m_1 = 2000$   
 $m_n = m_{n-1} - 320$
- 2)  $m_n = 2000(0.84)^{n-1}$
- 3)  $m_1 = 2000$   
 $m_n = (0.84)m_{n-1}$
- 4)  $m_n = 2000(0.84)^{n+1}$
- 320 The expression  $2 - \frac{x-1}{x+2}$  is equivalent to
- 1)  $1 - \frac{3}{x+2}$
- 2)  $1 + \frac{3}{x+2}$
- 3)  $1 - \frac{1}{x+2}$
- 4)  $1 + \frac{1}{x+2}$
- 321 The scores on a mathematics college-entry exam are normally distributed with a mean of 68 and standard deviation 7.2. Students scoring higher than one standard deviation above the mean will not be enrolled in the mathematics tutoring program. How many of the 750 incoming students can be expected to be enrolled in the tutoring program?
- 1) 631
- 2) 512
- 3) 238
- 4) 119
- 322 The temperature, in degrees Fahrenheit, in Times Square during a day in August can be predicted by the function  $T(x) = 8\sin(0.3x - 3) + 74$ , where  $x$  is the number of hours after midnight. According to this model, the predicted temperature, to the nearest degree Fahrenheit, at 7 P.M. is
- 1) 68
- 2) 74
- 3) 77
- 4) 81
- 323 The height above ground for a person riding a Ferris wheel after  $t$  seconds is modeled by  $h(t) = 150\sin\left(\frac{\pi}{45}t + 67.5\right) + 160$  feet. How many seconds does it take to go from the bottom of the wheel to the top of the wheel?
- 1) 10
- 2) 45
- 3) 90
- 4) 150
- 324 There are 440 students at Thomas Paine High School enrolled in U.S. History. On the April report card, the students' grades are approximately normally distributed with a mean of 79 and a standard deviation of 7. Students who earn a grade less than or equal to 64.9 must attend summer school. The number of students who must attend summer school for U.S. History is closest to
- 1) 3
- 2) 5
- 3) 10
- 4) 22
- 325 If  $f(x) = \log_3 x$  and  $g(x)$  is the image of  $f(x)$  after a translation five units to the left, which equation represents  $g(x)$ ?
- 1)  $g(x) = \log_3(x + 5)$
- 2)  $g(x) = \log_3 x + 5$
- 3)  $g(x) = \log_3(x - 5)$
- 4)  $g(x) = \log_3 x - 5$

Algebra II Multiple Choice Regents Exam Questions

[www.jmap.org](http://www.jmap.org)

- 326 The hours of daylight,  $y$ , in Utica in days,  $x$ , from January 1, 2013 can be modeled by the equation  $y = 3.06\sin(0.017x - 1.40) + 12.23$ . How many hours of daylight, to the *nearest tenth*, does this model predict for February 14, 2013?
- 1) 9.4
  - 2) 10.4
  - 3) 12.1
  - 4) 12.2
- 327 The roots of the equation  $3x^2 + 2x = -7$  are
- 1)  $-2, -\frac{1}{3}$
  - 2)  $-\frac{7}{3}, 1$
  - 3)  $-\frac{1}{3} \pm \frac{2i\sqrt{5}}{3}$
  - 4)  $-\frac{1}{3} \pm \frac{\sqrt{11}}{3}$
- 328 The completely factored form of  $n^4 - 9n^2 + 4n^3 - 36n - 12n^2 + 108$  is
- 1)  $(n^2 - 9)(n + 6)(n - 2)$
  - 2)  $(n + 3)(n - 3)(n + 6)(n - 2)$
  - 3)  $(n - 3)(n - 3)(n + 6)(n - 2)$
  - 4)  $(n + 3)(n - 3)(n - 6)(n + 2)$
- 329 The function  $N(t) = 100e^{-0.023t}$  models the number of grams in a sample of cesium-137 that remain after  $t$  years. On which interval is the sample's average rate of decay the fastest?
- 1)  $[1, 10]$
  - 2)  $[10, 20]$
  - 3)  $[15, 25]$
  - 4)  $[1, 30]$
- 330 The solutions to the equation  $5x^2 - 2x + 13 = 9$  are
- 1)  $\frac{1}{5} \pm \frac{\sqrt{21}}{5}$
  - 2)  $\frac{1}{5} \pm \frac{\sqrt{19}}{5}i$
  - 3)  $\frac{1}{5} \pm \frac{\sqrt{66}}{5}i$
  - 4)  $\frac{1}{5} \pm \frac{\sqrt{66}}{5}$
- 331 At her job, Pat earns \$25,000 the first year and receives a raise of \$1000 each year. The explicit formula for the  $n$ th term of this sequence is  $a_n = 25,000 + (n - 1)1000$ . Which rule best represents the equivalent recursive formula?
- 1)  $a_n = 24,000 + 1000n$
  - 2)  $a_n = 25,000 + 1000n$
  - 3)  $a_1 = 25,000, a_n = a_{n-1} + 1000$
  - 4)  $a_1 = 25,000, a_n = a_{n+1} + 1000$
- 332 For the system shown below, what is the value of  $z$ ?
- $$y = -2x + 14$$
- $$3x - 4z = 2$$
- $$3x - y = 16$$
- 1) 5
  - 2) 2
  - 3) 6
  - 4) 4
- 333 The solutions to  $x + 3 - \frac{4}{x-1} = 5$  are
- 1)  $\frac{3}{2} \pm \frac{\sqrt{17}}{2}$
  - 2)  $\frac{3}{2} \pm \frac{\sqrt{17}}{2}i$
  - 3)  $\frac{3}{2} \pm \frac{\sqrt{33}}{2}$
  - 4)  $\frac{3}{2} \pm \frac{\sqrt{33}}{2}i$
- 334 A random sample of 100 people that would best estimate the proportion of all registered voters in a district who support improvements to the high school football field should be drawn from registered voters in the district at a
- 1) football game
  - 2) supermarket
  - 3) school fund-raiser
  - 4) high school band concert

- 335 The equation  $t = \frac{1}{0.0105} \ln\left(\frac{A}{5000}\right)$  relates time,  $t$ , in years, to the amount of money,  $A$ , earned by a \$5000 investment. Which statement accurately describes the relationship between the average rates of change of  $t$  on the intervals  $[6000, 8000]$  and  $[9000, 12,000]$ ?
- 1) A comparison cannot be made because the intervals are different sizes.
  - 2) The average rate of change is equal for both intervals.
  - 3) The average rate of change is larger for the interval  $[6000, 8000]$ .
  - 4) The average rate of change is larger for the interval  $[9000, 12,000]$ .

- 336 Suppose events  $A$  and  $B$  are independent and  $P(A \text{ and } B)$  is 0.2. Which statement could be true?
- 1)  $P(A) = 0.4, P(B) = 0.3, P(A \text{ or } B) = 0.5$
  - 2)  $P(A) = 0.8, P(B) = 0.25$
  - 3)  $P(A|B) = 0.2, P(B) = 0.2$
  - 4)  $P(A) = 0.15, P(B) = 0.05$

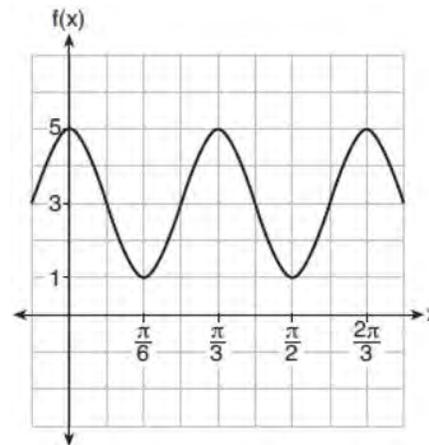
- 337 If  $\cos \theta = -\frac{3}{4}$  and  $\theta$  is in Quadrant III, then  $\sin \theta$  is equivalent to
- 1)  $-\frac{\sqrt{7}}{4}$
  - 2)  $\frac{\sqrt{7}}{4}$
  - 3)  $-\frac{5}{4}$
  - 4)  $\frac{5}{4}$

- 338 If  $A = -3 + 5i, B = 4 - 2i$ , and  $C = 1 + 6i$ , where  $i$  is the imaginary unit, then  $A - BC$  equals
- 1)  $5 - 17i$
  - 2)  $5 + 27i$
  - 3)  $-19 - 17i$
  - 4)  $-19 + 27i$

- 339 Which statement below about the graph of  $f(x) = -\log(x + 4) + 2$  is true?

- 1)  $f(x)$  has a y-intercept at  $(0, 2)$ .
- 2)  $-f(x)$  has a y-intercept at  $(0, 2)$ .
- 3) As  $x \rightarrow \infty, f(x) \rightarrow \infty$ .
- 4)  $x \rightarrow -4, f(x) \rightarrow \infty$ .

- 340 The function  $f(x) = a \cos bx + c$  is plotted on the graph shown below.



What are the values of  $a, b,$  and  $c$ ?

- 1)  $a = 2, b = 6, c = 3$
- 2)  $a = 2, b = 3, c = 1$
- 3)  $a = 4, b = 6, c = 5$
- 4)  $a = 4, b = \frac{\pi}{3}, c = 3$

- 341 For all values of  $x$  for which the expression is defined,  $\frac{x^3 + 2x^2 - 9x - 18}{x^3 - x^2 - 6x}$ , in simplest form, is equivalent to

- 1) 3
- 2)  $-\frac{17}{2}$
- 3)  $\frac{x+3}{x}$
- 4)  $\frac{x^2 - 9}{x(x-3)}$

Algebra II Multiple Choice Regents Exam Questions

[www.jmap.org](http://www.jmap.org)

- 342 What is the inverse of  $f(x) = \frac{x}{x+2}$ , where  $x \neq -2$ ?
- $f^{-1}(x) = \frac{2x}{x-1}$
  - $f^{-1}(x) = \frac{-2x}{x-1}$
  - $f^{-1}(x) = \frac{x}{x-2}$
  - $f^{-1}(x) = \frac{-x}{x-2}$
- 343 Savannah just got contact lenses. Her doctor said she can wear them 2 hours the first day, and can then increase the length of time by 30 minutes each day. If this pattern continues, which formula would *not* be appropriate to determine the length of time, in either minutes or hours, she could wear her contact lenses on the  $n$ th day?
- $a_1 = 120$   
 $a_n = a_{n-1} + 30$
  - $a_n = 90 + 30n$
  - $a_1 = 2$   
 $a_n = a_{n-1} + 0.5$
  - $a_n = 2.5 + 0.5n$
- 344 The expression  $6 - (3x - 2i)^2$  is equivalent to
- $-9x^2 + 12xi + 10$
  - $9x^2 - 12xi + 2$
  - $-9x^2 + 10$
  - $-9x^2 + 12xi - 4i + 6$
- 345 When the expression  $(x+2)^2 + 4(x+2) + 3$  is rewritten as the product of two binomials, the result is
- $(x+3)(x+1)$
  - $(x+5)(x+3)$
  - $(x+2)(x+2)$
  - $(x+6)(x+1)$
- 346 A certain pain reliever is taken in 220 mg dosages and has a half-life of 12 hours. The function  $A = 220\left(\frac{1}{2}\right)^{\frac{t}{12}}$  can be used to model this situation, where  $A$  is the amount of pain reliever in milligrams remaining in the body after  $t$  hours. According to this function, which statement is true?
- Every hour, the amount of pain reliever remaining is cut in half.
  - In 12 hours, there is no pain reliever remaining in the body.
  - In 24 hours, there is no pain reliever remaining in the body.
  - In 12 hours, 110 mg of pain reliever is remaining.
- 347 Where  $i$  is the imaginary unit, the expression  $(x+3i)^2 - (2x-3i)^2$  is equivalent to
- $-3x^2$
  - $-3x^2 - 18$
  - $-3x^2 + 18xi$
  - $-3x^2 - 6xi - 18$
- 348 If  $x-1$  is a factor of  $x^3 - kx^2 + 2x$ , what is the value of  $k$ ?
- 0
  - 2
  - 3
  - 3
- 349 A researcher randomly divides 50 bean plants into two groups. He puts one group by a window to receive natural light and the second group under artificial light. He records the growth of the plants weekly. Which data collection method is described in this situation?
- observational study
  - controlled experiment
  - survey
  - systematic sample
- 350 The expression  $(x+a)(x+b)$  can *not* be written as
- $a(x+b) + x(x+b)$
  - $x^2 + abx + ab$
  - $x^2 + (a+b)x + ab$
  - $x(x+a) + b(x+a)$



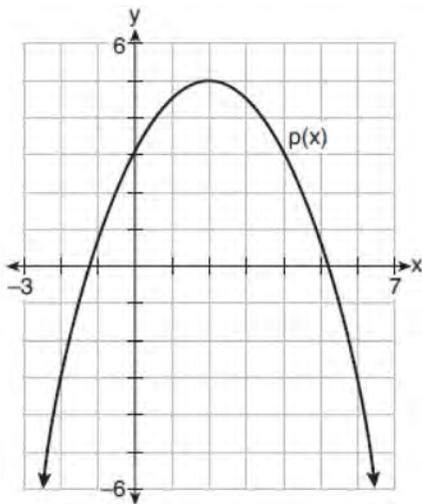
357 On a given school day, the probability that Nick oversleeps is 48% and the probability he has a pop quiz is 25%. Assuming these two events are independent, what is the probability that Nick oversleeps and has a pop quiz on the same day?

- 1) 73%
- 2) 36%
- 3) 23%
- 4) 12%

358 The solution set for the equation  $b = \sqrt{2b^2 - 64}$  is

- 1)  $\{-8\}$
- 2)  $\{8\}$
- 3)  $\{\pm 8\}$
- 4)  $\{ \}$

359 Consider  $f(x) = 4x^2 + 6x - 3$ , and  $p(x)$  defined by the graph below.



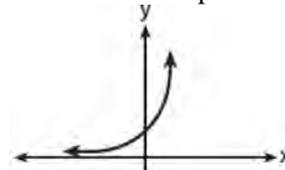
The difference between the values of the maximum of  $p$  and minimum of  $f$  is

- 1) 0.25
- 2) 1.25
- 3) 3.25
- 4) 10.25

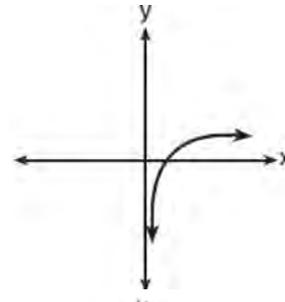
360 Which function is even?

- 1)  $f(x) = \sin x$
- 2)  $f(x) = x^2 - 4$
- 3)  $f(x) = |x - 2| + 5$
- 4)  $f(x) = x^4 + 3x^3 + 4$

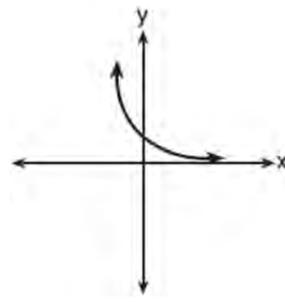
361 Which sketch best represents the graph of  $x = 3^y$ ?



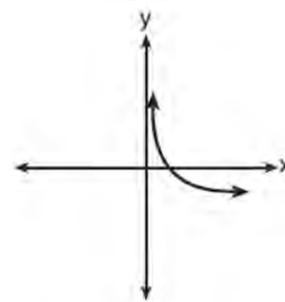
1)



2)



3)



4)

362 For  $x > 0$ , which expression is equivalent to

$$\frac{\sqrt[3]{x^2} \cdot \sqrt{x^5}}{\sqrt[6]{x}} ?$$

- 1)  $x$
- 2)  $x^{\frac{3}{2}}$
- 3)  $x^3$
- 4)  $x^{10}$

363 What is the inverse of  $f(x) = -6(x - 2)$ ?

- 1)  $f^{-1}(x) = -2 - \frac{x}{6}$
- 2)  $f^{-1}(x) = 2 - \frac{x}{6}$
- 3)  $f^{-1}(x) = \frac{1}{-6(x - 2)}$
- 4)  $f^{-1}(x) = 6(x + 2)$

364 Which expression can be rewritten as  $(x + 7)(x - 1)$ ?

- 1)  $(x + 3)^2 - 16$
- 2)  $(x + 3)^2 - 10(x + 3) - 2(x + 3) + 20$
- 3)  $\frac{(x - 1)(x^2 - 6x - 7)}{(x + 1)}$
- 4)  $\frac{(x + 7)(x^2 + 4x + 3)}{(x + 3)}$

365 If  $f(x) = x^2 + 9$  and  $g(x) = x + 3$ , which operation would not result in a polynomial expression?

- 1)  $f(x) + g(x)$
- 2)  $f(x) - g(x)$
- 3)  $f(x) \cdot g(x)$
- 4)  $f(x) \div g(x)$

366 Given  $f(x) = \frac{1}{2}x + 8$ , which equation represents the inverse,  $g(x)$ ?

- 1)  $g(x) = 2x - 8$
- 2)  $g(x) = 2x - 16$
- 3)  $g(x) = -\frac{1}{2}x + 8$
- 4)  $g(x) = -\frac{1}{2}x - 16$

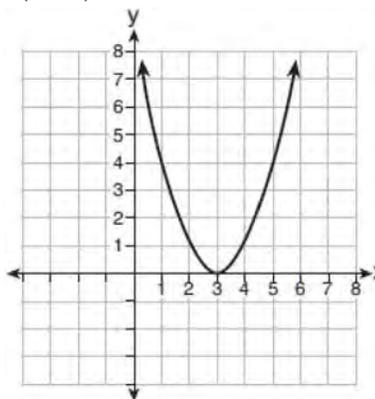
367 For  $x \geq 0$ , which equation is *false*?

- 1)  $(x^{\frac{3}{2}})^2 = \sqrt[4]{x^3}$
- 2)  $(x^3)^{\frac{1}{4}} = \sqrt[4]{x^3}$
- 3)  $(x^{\frac{3}{2}})^{\frac{1}{2}} = \sqrt[4]{x^3}$
- 4)  $(x^{\frac{2}{3}})^2 = \sqrt[3]{x^4}$

368 Which representation of a quadratic has imaginary roots?

| x    | y  |
|------|----|
| -2.5 | 2  |
| -2.0 | 0  |
| -1.5 | -1 |
| -1.0 | -1 |
| -0.5 | 0  |
| 0.0  | 2  |

- 1)
- 2)  $2(x + 3)^2 = 64$



- 3)
- 4)  $2x^2 + 32 = 0$

369 What is the solution set of the equation

$$\frac{2}{3x + 1} = \frac{1}{x} - \frac{6x}{3x + 1}?$$

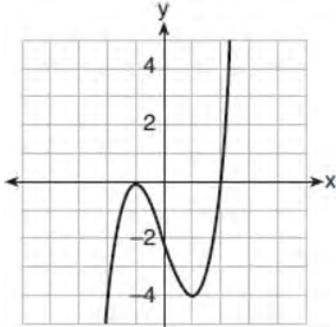
- 1)  $\left\{-\frac{1}{3}, \frac{1}{2}\right\}$
- 2)  $\left\{-\frac{1}{3}\right\}$
- 3)  $\left\{\frac{1}{2}\right\}$
- 4)  $\left\{\frac{1}{3}, -2\right\}$

370 What is the solution set of the equation

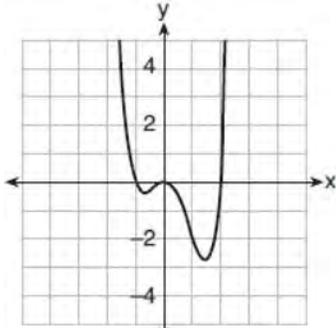
$$\frac{10}{x^2 - 2x} + \frac{4}{x} = \frac{5}{x - 2}?$$

- 1)  $\{0, 2\}$
- 2)  $\{0\}$
- 3)  $\{2\}$
- 4)  $\{\}$

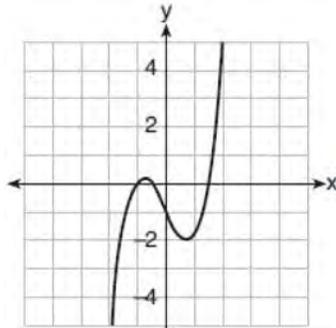
371 Which graph represents a polynomial function that contains  $x^2 + 2x + 1$  as a factor?



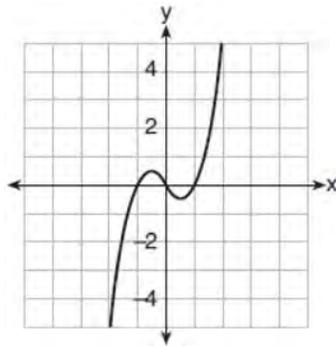
1)



2)



3)



4)

372 After examining the functions  $f(x) = \ln(x + 2)$  and  $g(x) = e^{x-1}$  over the interval  $(-2, 3]$ , Lexi determined that the correct number of solutions to the equation  $f(x) = g(x)$  is

- 1) 1
- 2) 2
- 3) 3
- 4) 0

373 Written in simplest form,  $\frac{c^2 - d^2}{d^2 + cd - 2c^2}$  where

$c \neq d$ , is equivalent to

- 1)  $\frac{c + d}{d + 2c}$
- 2)  $\frac{c - d}{d + 2c}$
- 3)  $\frac{-c - d}{d + 2c}$
- 4)  $\frac{-c + d}{d + 2c}$

374 The solution of  $87e^{0.3x} = 5918$ , to the nearest thousandth, is

- 1) 0.583
- 2) 1.945
- 3) 4.220
- 4) 14.066

375 Which situation could be modeled using a geometric sequence?

- 1) A cell phone company charges \$30.00 per month for 2 gigabytes of data and \$12.50 for each additional gigabyte of data.
- 2) The temperature in your car is  $79^\circ$ . You lower the temperature of your air conditioning by  $2^\circ$  every 3 minutes in order to find a comfortable temperature.
- 3) David's parents have set a limit of 50 minutes per week that he may play online games during the school year. However, they will increase his time by 5% per week for the next ten weeks.
- 4) Sarah has \$100.00 in her piggy bank and saves an additional \$15.00 each week.



**Algebra II Multiple Choice Regents Exam Questions**

382 Joelle has a credit card that has a 19.2% annual interest rate compounded monthly. She owes a total balance of  $B$  dollars after  $m$  months. Assuming she makes no payments on her account, the table below illustrates the balance she owes after  $m$  months.

| <b>m</b> | <b>B</b> |
|----------|----------|
| 0        | 100.00   |
| 10       | 1172.00  |
| 19       | 1352.00  |
| 36       | 1770.80  |
| 60       | 2591.90  |
| 69       | 2990.00  |
| 72       | 3135.80  |
| 73       | 3186.00  |

Over which interval of time is her average rate of change for the balance on her credit card account the greatest?

- 1) month 10 to month 60
- 2) month 19 to month 69
- 3) month 36 to month 72
- 4) month 60 to month 73

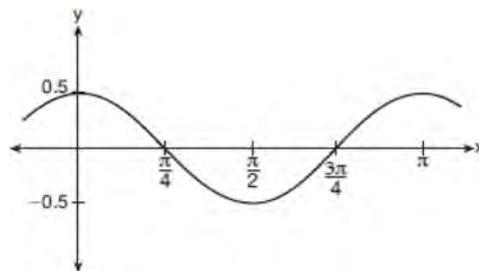
383 Last year, the total revenue for Home Style, a national restaurant chain, increased 5.25% over the previous year. If this trend were to continue, which expression could the company's chief financial officer use to approximate their monthly percent increase in revenue? [Let  $m$  represent months.]

- 1)  $(1.0525)^m$
- 2)  $(1.0525)^{\frac{12}{m}}$
- 3)  $(1.00427)^m$
- 4)  $(1.00427)^{\frac{m}{12}}$

384 Sean's team has a baseball game tomorrow. He pitches 50% of the games. There is a 40% chance of rain during the game tomorrow. If the probability that it rains given that Sean pitches is 40%, it can be concluded that these two events are

- 1) independent
- 2) dependent
- 3) mutually exclusive
- 4) complements

385 Which equation is represented by the graph shown below?

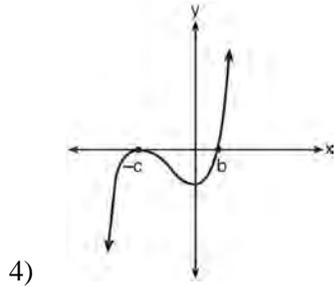
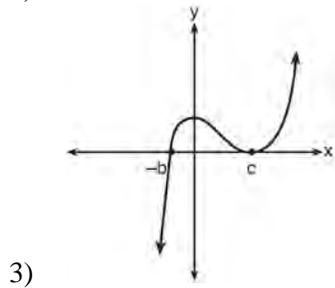
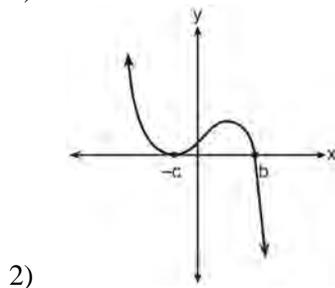
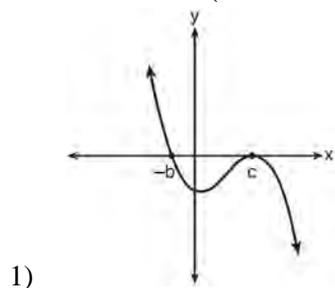


- 1)  $y = \frac{1}{2} \cos 2x$
- 2)  $y = \cos x$
- 3)  $y = \frac{1}{2} \cos x$
- 4)  $y = 2 \cos \frac{1}{2} x$

386 The distribution of the diameters of ball bearings made under a given manufacturing process is normally distributed with a mean of 4 cm and a standard deviation of 0.2 cm. What proportion of the ball bearings will have a diameter less than 3.7 cm?

- 1) 0.0668
- 2) 0.4332
- 3) 0.8664
- 4) 0.9500

387 If  $a$ ,  $b$ , and  $c$  are all positive real numbers, which graph could represent the sketch of the graph of  $p(x) = -a(x+b)(x^2 - 2cx + c^2)$ ?



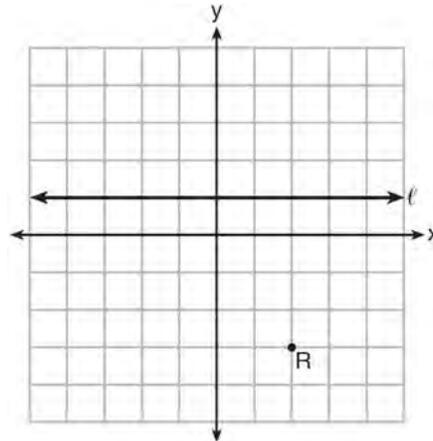
388 If  $\sin^2(32^\circ) + \cos^2(M) = 1$ , then  $M$  equals

- 1)  $32^\circ$
- 2)  $58^\circ$
- 3)  $68^\circ$
- 4)  $72^\circ$

389 What is the solution to  $8(2^{x+3}) = 48$ ?

- 1)  $x = \frac{\ln 6}{\ln 2} - 3$
- 2)  $x = 0$
- 3)  $x = \frac{\ln 48}{\ln 16} - 3$
- 4)  $x = \ln 4 - 3$

390 Which equation represents the set of points equidistant from line  $\ell$  and point  $R$  shown on the graph below?



- 1)  $y = -\frac{1}{8}(x+2)^2 + 1$
- 2)  $y = -\frac{1}{8}(x+2)^2 - 1$
- 3)  $y = -\frac{1}{8}(x-2)^2 + 1$
- 4)  $y = -\frac{1}{8}(x-2)^2 - 1$

391 If  $f(x) = 3|x| - 1$  and  $g(x) = 0.03x^3 - x + 1$ , an approximate solution for the equation  $f(x) = g(x)$  is

- 1) 1.96
- 2) 11.29
- 3)  $(-0.99, 1.96)$
- 4)  $(11.29, 32.87)$

Algebra II Multiple Choice Regents Exam Questions

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- 392 Which value is *not* contained in the solution of the system shown below?

$$a + 5b - c = -20$$

$$4a - 5b + 4c = 19$$

$$-a - 5b - 5c = 2$$

- 1)  $-2$   
 2)  $2$   
 3)  $3$   
 4)  $-3$
- 393 Mallory wants to buy a new window air conditioning unit. The cost for the unit is \$329.99. If she plans to run the unit three months out of the year for an annual operating cost of \$108.78, which function models the cost per year over the lifetime of the unit,  $C(n)$ , in terms of the number of years,  $n$ , that she owns the air conditioner.

1)  $C(n) = 329.99 + 108.78n$

2)  $C(n) = 329.99 + 326.34n$

3)  $C(n) = \frac{329.99 + 108.78n}{n}$

4)  $C(n) = \frac{329.99 + 326.34n}{n}$

- 394 Pedro and Bobby each own an ant farm. Pedro starts with 100 ants and says his farm is growing exponentially at a rate of 15% per month. Bobby starts with 350 ants and says his farm is steadily decreasing by 5 ants per month. Assuming both boys are accurate in describing the population of their ant farms, after how many months will they both have approximately the same number of ants?

- 1) 7  
 2) 8  
 3) 13  
 4) 36

- 395 When  $g(x)$  is divided by  $x + 4$ , the remainder is 0. Given  $g(x) = x^4 + 3x^3 - 6x^2 - 6x + 8$ , which conclusion about  $g(x)$  is true?

- 1)  $g(4) = 0$   
 2)  $g(-4) = 0$   
 3)  $x - 4$  is a factor of  $g(x)$ .  
 4) No conclusion can be made regarding  $g(x)$ .

- 396 In 2010, the population of New York State was approximately 19,378,000 with an annual growth rate of 1.5%. Assuming the growth rate is maintained for a large number of years, which equation can be used to predict the population of New York State  $t$  years after 2010?

1)  $P_t = 19,378,000(1.5)^t$

2)  $P_0 = 19,378,000$

$$P_t = 19,378,000 + 1.015P_{t-1}$$

3)  $P_t = 19,378,000(1.015)^{t-1}$

4)  $P_0 = 19,378,000$

$$P_t = 1.015P_{t-1}$$

- 397 The expression  $\left(\frac{m^2}{m^{\frac{1}{3}}}\right)^{\frac{1}{2}}$  is equivalent to

1)  $-\sqrt[6]{m^5}$

2)  $\frac{1}{\sqrt[6]{m^5}}$

3)  $-m^5\sqrt{m}$

4)  $\frac{1}{m^5\sqrt{m}}$

- 398 The completely factored form of  $2d^4 + 6d^3 - 18d^2 - 54d$  is

1)  $2d(d^2 - 9)(d + 3)$

2)  $2d(d^2 + 9)(d + 3)$

3)  $2d(d + 3)^2(d - 3)$

4)  $2d(d - 3)^2(d + 3)$

- 399 Which function represents exponential decay?

1)  $y = 2^{0.3t}$

2)  $y = 1.2^{3t}$

3)  $y = \left(\frac{1}{2}\right)^{-t}$

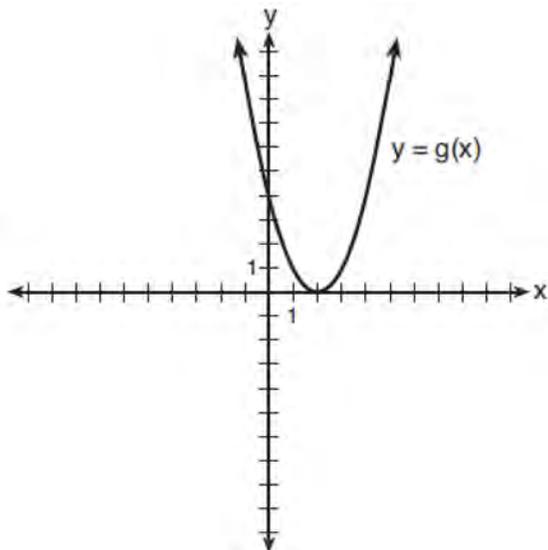
4)  $y = 5^{-t}$

400 The probability that Gary and Jane have a child with blue eyes is 0.25, and the probability that they have a child with blond hair is 0.5. The probability that they have a child with both blue eyes and blond hair is 0.125. Given this information, the events blue eyes and blond hair are

- I: dependent
- II: independent
- III: mutually exclusive

- 1) I, only
- 2) II, only
- 3) I and III
- 4) II and III

401 What is the solution to the system of equations  $y = 3x - 2$  and  $y = g(x)$  where  $g(x)$  is defined by the function below?

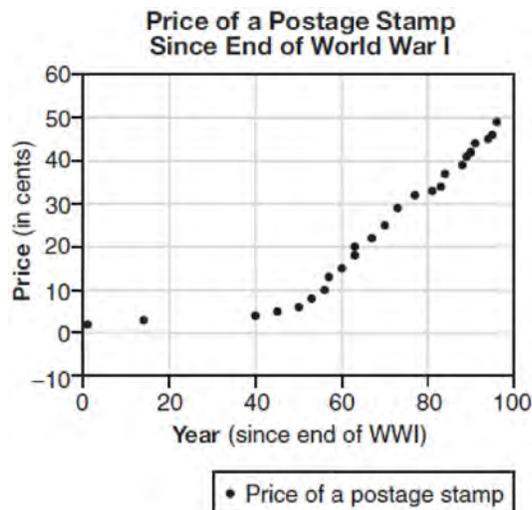


- 1)  $\{(0, -2)\}$
- 2)  $\{(0, -2), (1, 6)\}$
- 3)  $\{(1, 6)\}$
- 4)  $\{(1, 1), (6, 16)\}$

402 A sine function increasing through the origin can be used to model light waves. Violet light has a wavelength of 400 nanometers. Over which interval is the height of the wave *decreasing*, only?

- 1) (0, 200)
- 2) (100, 300)
- 3) (200, 400)
- 4) (300, 400)

403 The price of a postage stamp in the years since the end of World War I is shown in the scatterplot below.



The equation that best models the price, in cents, of a postage stamp based on these data is

- 1)  $y = 0.59x - 14.82$
- 2)  $y = 1.04(1.43)^x$
- 3)  $y = 1.43(1.04)^x$
- 4)  $y = 24 \sin(14x) + 25$

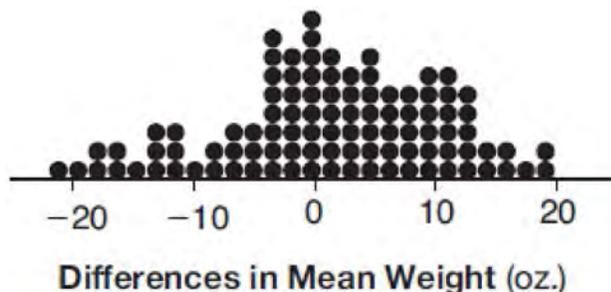
404 According to a pricing website, Indroid phones lose 58% of their cash value over 1.5 years. Which expression can be used to estimate the value of a \$300 Indroid phone in 1.5 years?

- 1)  $300e^{-0.87}$
- 2)  $300e^{-0.63}$
- 3)  $300e^{-0.58}$
- 4)  $300e^{-0.42}$

405 Which statement about statistical analysis is *false*?

- 1) Experiments can suggest patterns and relationships in data.
- 2) Experiments can determine cause and effect relationships.
- 3) Observational studies can determine cause and effect relationships.
- 4) Observational studies can suggest patterns and relationships in data.

- 406 Gabriel performed an experiment to see if planting 13 tomato plants in black plastic mulch leads to larger tomatoes than if 13 plants are planted without mulch. He observed that the average weight of the tomatoes from tomato plants grown in black plastic mulch was 5 ounces greater than those from the plants planted without mulch. To determine if the observed difference is statistically significant, he rerandomized the tomato groups 100 times to study these random differences in the mean weights. The output of his simulation is summarized in the dotplot below.



Given these results, what is an appropriate inference that can be drawn?

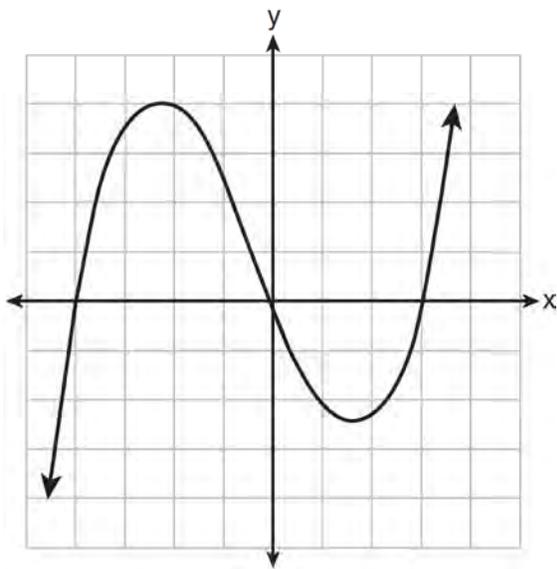
- 1) There was no effect observed between the two groups.
- 2) There was an effect observed that could be due to the random assignment of plants to the groups.
- 3) There is strong evidence to support the hypothesis that tomatoes from plants planted in black plastic mulch are larger than those planted without mulch.
- 4) There is strong evidence to support the hypothesis that tomatoes from plants planted without mulch are larger than those planted in black plastic mulch.
- 407 Julie averaged 85 on the first three tests of the semester in her mathematics class. If she scores 93 on each of the remaining tests, her average will be 90. Which equation could be used to determine how many tests,  $T$ , are left in the semester?
- 1)  $\frac{255 + 93T}{3T} = 90$
- 2)  $\frac{255 + 90T}{3T} = 93$
- 3)  $\frac{255 + 93T}{T + 3} = 90$
- 4)  $\frac{255 + 90T}{T + 3} = 93$
- 408 What is the inverse of the function  $y = \log_3 x$ ?
- 1)  $y = x^3$
- 2)  $y = \log_x 3$
- 3)  $y = 3^x$
- 4)  $x = 3^y$
- 409 The expression  $\frac{-3x^2 - 5x + 2}{x^3 + 2x^2}$  can be rewritten as
- 1)  $\frac{-3x - 3}{x^2 + 2x}$
- 2)  $\frac{-3x - 1}{x^2}$
- 3)  $-3x^{-1} + 1$
- 4)  $-3x^{-1} + x^{-2}$
- 410 The expression  $\frac{4x^3 + 5x + 10}{2x + 3}$  is equivalent to
- 1)  $2x^2 + 3x - 7 + \frac{31}{2x + 3}$
- 2)  $2x^2 - 3x + 7 - \frac{11}{2x + 3}$
- 3)  $2x^2 + 2.5x + 5 + \frac{15}{2x + 3}$
- 4)  $2x^2 - 2.5x - 5 - \frac{20}{2x + 3}$



416 The expression  $\frac{6x^3 + 17x^2 + 10x + 2}{2x + 3}$  equals

- 1)  $3x^2 + 4x - 1 + \frac{5}{2x + 3}$
- 2)  $6x^2 + 8x - 2 + \frac{5}{2x + 3}$
- 3)  $6x^2 - x + 13 - \frac{37}{2x + 3}$
- 4)  $3x^2 + 13x + \frac{49}{2} + \frac{151}{2x + 3}$

417 The graph of  $p(x)$  is shown below.



What is the remainder when  $p(x)$  is divided by  $x + 4$ ?

- 1)  $x - 4$
- 2)  $-4$
- 3)  $0$
- 4)  $4$

418 The expression  $6xi^3(-4xi + 5)$  is equivalent to

- 1)  $2x - 5i$
- 2)  $-24x^2 - 30xi$
- 3)  $-24x^2 + 30x - i$
- 4)  $26x - 24x^2i - 5i$

419 A circle centered at the origin has a radius of 10 units. The terminal side of an angle,  $\theta$ , intercepts the circle in Quadrant II at point  $C$ . The  $y$ -coordinate of point  $C$  is 8. What is the value of  $\cos \theta$ ?

- 1)  $-\frac{3}{5}$
- 2)  $-\frac{3}{4}$
- 3)  $\frac{3}{5}$
- 4)  $\frac{4}{5}$

420 The solution to the equation  $4x^2 + 98 = 0$  is

- 1)  $\pm 7$
- 2)  $\pm 7i$
- 3)  $\pm \frac{7\sqrt{2}}{2}$
- 4)  $\pm \frac{7i\sqrt{2}}{2}$

421 The sequence  $a_1 = 6$ ,  $a_n = 3a_{n-1}$  can also be written as

- 1)  $a_n = 6 \cdot 3^n$
- 2)  $a_n = 6 \cdot 3^{n+1}$
- 3)  $a_n = 2 \cdot 3^n$
- 4)  $a_n = 2 \cdot 3^{n+1}$

422 Which statement is *incorrect* for the graph of the function  $y = -3 \cos \left[ \frac{\pi}{3} (x - 4) \right] + 7$ ?

- 1) The period is 6.
- 2) The amplitude is 3.
- 3) The range is  $[4, 10]$ .
- 4) The midline is  $y = -4$ .

423 A parabola has its focus at  $(1, 2)$  and its directrix is  $y = -2$ . The equation of this parabola could be

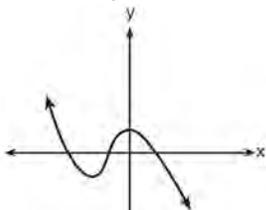
- 1)  $y = 8(x + 1)^2$
- 2)  $y = \frac{1}{8}(x + 1)^2$
- 3)  $y = 8(x - 1)^2$
- 4)  $y = \frac{1}{8}(x - 1)^2$

Algebra II Multiple Choice Regents Exam Questions

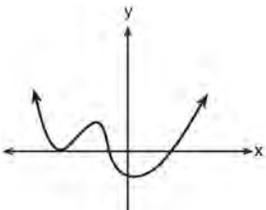
[www.jmap.org](http://www.jmap.org)

424 Which graph has the following characteristics?

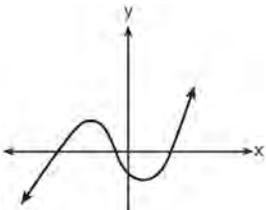
- three real zeros
- as  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$
- as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$



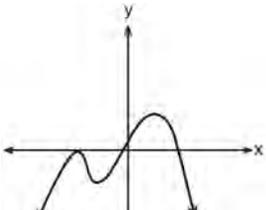
1)



2)



3)



4)

425 Which equation represents an odd function?

- 1)  $y = \sin x$
- 2)  $y = \cos x$
- 3)  $y = (x + 1)^3$
- 4)  $y = e^{5x}$

426 Which statement regarding the graphs of the functions below is *untrue*?

$$f(x) = 3 \sin 2x, \text{ from } -\pi < x < \pi$$

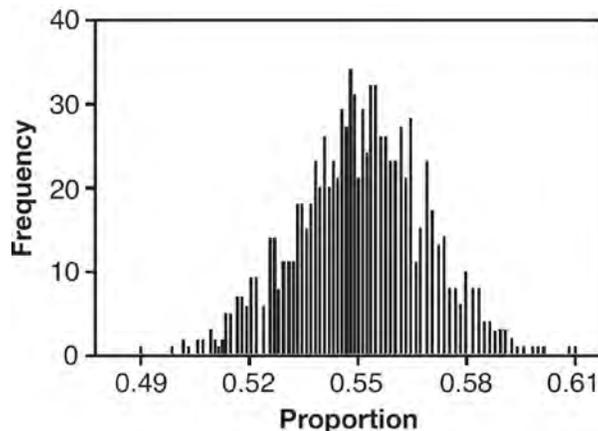
$$g(x) = (x - 0.5)(x + 4)(x - 2)$$

$$h(x) = \log_2 x$$

$$j(x) = -|4x - 2| + 3$$

- 1)  $f(x)$  and  $j(x)$  have a maximum  $y$ -value of 3.
- 2)  $f(x)$ ,  $h(x)$ , and  $j(x)$  have one  $y$ -intercept.
- 3)  $g(x)$  and  $j(x)$  have the same end behavior as  $x \rightarrow -\infty$ .
- 4)  $g(x)$ ,  $h(x)$ , and  $j(x)$  have rational zeros.

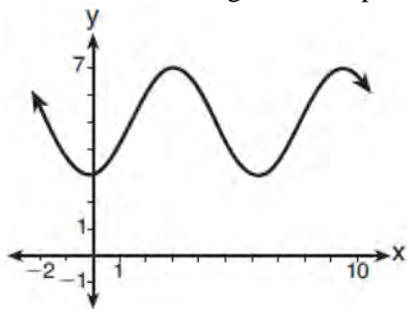
427 A candidate for political office commissioned a poll. His staff received responses from 900 likely voters and 55% of them said they would vote for the candidate. The staff then conducted a simulation of 1000 more polls of 900 voters, assuming that 55% of voters would vote for their candidate. The output of the simulation is shown in the diagram below.



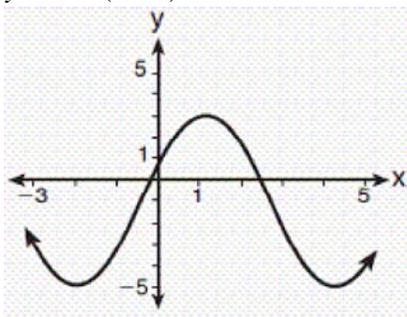
Given this output, and assuming a 95% confidence level, the margin of error for the poll is closest to

- 1) 0.01
- 2) 0.03
- 3) 0.06
- 4) 0.12

428 Which sinusoid has the greatest amplitude?



- 1)  
2)  $y = 3 \sin(\theta - 3) + 5$



- 3)  
4)  $y = -5 \sin(\theta - 1) - 3$

429 A study of the annual population of the red-winged blackbird in Ft. Mill, South Carolina, shows the population,  $B(t)$ , can be represented by the function

$B(t) = 750(1.16)^t$ , where the  $t$  represents the number of years since the study began. In terms of the monthly rate of growth, the population of red-winged blackbirds can be best approximated by the function

- 1)  $B(t) = 750(1.012)^t$   
2)  $B(t) = 750(1.012)^{12t}$   
3)  $B(t) = 750(1.16)^{12t}$   
4)  $B(t) = 750(1.16)^{\frac{t}{12}}$

430 The solution set for the equation

$$\sqrt{x+14} - \sqrt{2x+5} = 1$$

- 1)  $\{-6\}$   
2)  $\{2\}$   
3)  $\{18\}$   
4)  $\{2, 22\}$

431 The solutions to the equation  $-\frac{1}{2}x^2 = -6x + 20$  are

- 1)  $-6 \pm 2i$   
2)  $-6 \pm 2\sqrt{19}$   
3)  $6 \pm 2i$   
4)  $6 \pm 2\sqrt{19}$

432 The solution to the equation  $18x^2 - 24x + 87 = 0$  is

- 1)  $-\frac{2}{3} \pm 6i\sqrt{158}$   
2)  $-\frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$   
3)  $\frac{2}{3} \pm 6i\sqrt{158}$   
4)  $\frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$

433 The focal length,  $F$ , of a camera's lens is related to the distance of the object from the lens,  $J$ , and the distance to the image area in the camera,  $W$ , by the formula below.

$$\frac{1}{J} + \frac{1}{W} = \frac{1}{F}$$

When this equation is solved for  $J$  in terms of  $F$  and  $W$ ,  $J$  equals

- 1)  $F - W$   
2)  $\frac{FW}{F - W}$   
3)  $\frac{FW}{W - F}$   
4)  $\frac{1}{F} - \frac{1}{W}$

434 Relative to the graph of  $y = 3 \sin x$ , what is the shift of the graph of  $y = 3 \sin\left(x + \frac{\pi}{3}\right)$ ?

- 1)  $\frac{\pi}{3}$  right  
2)  $\frac{\pi}{3}$  left  
3)  $\frac{\pi}{3}$  up  
4)  $\frac{\pi}{3}$  down

435 The function  $p(t) = 110e^{0.03922t}$  models the population of a city, in millions,  $t$  years after 2010. As of today, consider the following two statements:

- I. The current population is 110 million.
- II. The population increases continuously by approximately 3.9% per year.

This model supports

- 1) I, only
- 2) II, only
- 3) both I and II
- 4) neither I nor II

436 Which expression is equivalent to  $\frac{4x^3 + 9x - 5}{2x - 1}$ ,

where  $x \neq \frac{1}{2}$ ?

- 1)  $2x^2 + x + 5$
- 2)  $2x^2 + \frac{11}{2} + \frac{1}{2(2x - 1)}$
- 3)  $2x^2 - x + 5$
- 4)  $2x^2 - x + 4 + \frac{1}{2x - 1}$

437 If  $p(x) = ab^x$  and  $r(x) = cd^x$ , then  $p(x) \cdot r(x)$  equals

- 1)  $ac(b + d)^x$
- 2)  $ac(b + d)^{2x}$
- 3)  $ac(bd)^x$
- 4)  $ac(bd)^{x^2}$

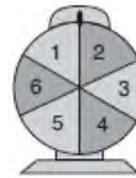
438 The value of a new car depreciates over time. Greg purchased a new car in June 2011. The value,  $V$ , of his car after  $t$  years can be modeled by the equation

$$\log_{0.8} \left( \frac{V}{17000} \right) = t.$$

What is the average decreasing rate of change per year of the value of the car from June 2012 to June 2014, to the nearest ten dollars per year?

- 1) 1960
- 2) 2180
- 3) 2450
- 4) 2770

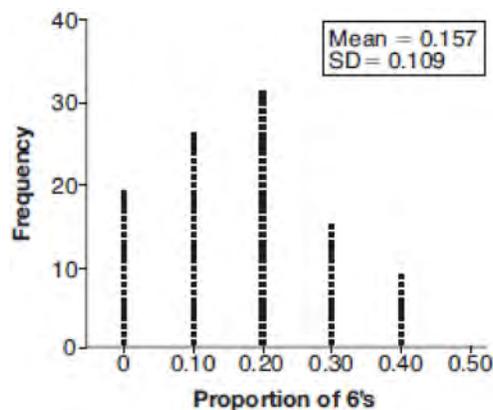
439 A game spinner is divided into 6 equally sized regions, as shown in the diagram below.



For Miles to win, the spinner must land on the number 6. After spinning the spinner 10 times, and losing all 10 times, Miles complained that the spinner is unfair. At home, his dad ran 100 simulations of spinning the spinner 10 times,

assuming the probability of winning each spin is  $\frac{1}{6}$ .

The output of the simulation is shown in the diagram below.



Which explanation is appropriate for Miles and his dad to make?

- 1) The spinner was likely unfair, since the number 6 failed to occur in about 20% of the simulations.
- 2) The spinner was likely unfair, since the spinner should have landed on the number 6 by the sixth spin.
- 3) The spinner was likely not unfair, since the number 6 failed to occur in about 20% of the simulations.
- 4) The spinner was likely not unfair, since in the output the player wins once or twice in the majority of the simulations.



446 When  $b > 0$  and  $d$  is a positive integer, the

expression  $(3b)^{\frac{2}{d}}$  is equivalent to

- 1)  $\frac{1}{\left(\sqrt[d]{3b}\right)^2}$
- 2)  $\left(\sqrt{3b}\right)^d$
- 3)  $\frac{1}{\sqrt{3b^d}}$
- 4)  $\left(\sqrt[d]{3b}\right)^2$

447 The profit function,  $p(x)$ , for a company is the cost function,  $c(x)$ , subtracted from the revenue function,  $r(x)$ . The profit function for the Acme Corporation is  $p(x) = -0.5x^2 + 250x - 300$  and the revenue function is  $r(x) = -0.3x^2 + 150x$ . The cost function for the Acme Corporation is

- 1)  $c(x) = 0.2x^2 - 100x + 300$
- 2)  $c(x) = 0.2x^2 + 100x + 300$
- 3)  $c(x) = -0.2x^2 + 100x - 300$
- 4)  $c(x) = -0.8x^2 + 400x - 300$

448 Mr. Farison gave his class the three mathematical rules shown below to either prove or disprove. Which rules can be proved for all real numbers?

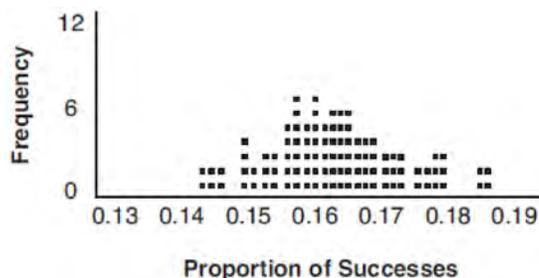
- I  $(m + p)^2 = m^2 + 2mp + p^2$
- II  $(x + y)^3 = x^3 + 3xy + y^3$
- III  $(a^2 + b^2)^2 = (a^2 - b^2)^2 + (2ab)^2$

- 1) I, only
- 2) I and II
- 3) II and III
- 4) I and III

449 Which value, to the nearest tenth, is not a solution of  $p(x) = q(x)$  if  $p(x) = x^3 + 3x^2 - 3x - 1$  and  $q(x) = 3x + 8$ ?

- 1) -3.9
- 2) -1.1
- 3) 2.1
- 4) 4.7

450 A study conducted in 2004 in New York City found that 212 out of 1334 participants had hypertension. Kim ran a simulation of 100 studies based on these data. The output of the simulation is shown in the diagram below.



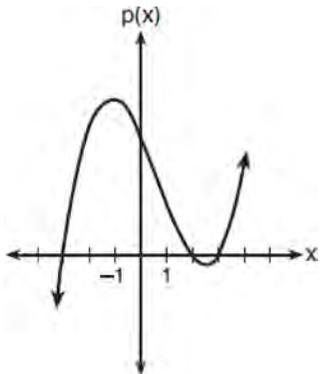
At a 95% confidence level, the proportion of New York City residents with hypertension and the margin of error are closest to

- 1) proportion  $\approx .16$ ; margin of error  $\approx .01$
- 2) proportion  $\approx .16$ ; margin of error  $\approx .02$
- 3) proportion  $\approx .01$ ; margin of error  $\approx .16$
- 4) proportion  $\approx .02$ ; margin of error  $\approx .16$

451 A payday loan company makes loans between \$100 and \$1000 available to customers. Every 14 days, customers are charged 30% interest with compounding. In 2013, Remi took out a \$300 payday loan. Which expression can be used to calculate the amount she would owe, in dollars, after one year if she did not make payments?

- 1)  $300(.30)^{\frac{14}{365}}$
- 2)  $300(1.30)^{\frac{14}{365}}$
- 3)  $300(.30)^{\frac{365}{14}}$
- 4)  $300(1.30)^{\frac{365}{14}}$

452 The graph of the function  $p(x)$  is sketched below.



Which equation could represent  $p(x)$ ?

- 1)  $p(x) = (x^2 - 9)(x - 2)$
  - 2)  $p(x) = x^3 - 2x^2 + 9x + 18$
  - 3)  $p(x) = (x^2 + 9)(x - 2)$
  - 4)  $p(x) = x^3 + 2x^2 - 9x - 18$
- 453 Sally's high school is planning their spring musical. The revenue,  $R$ , generated can be determined by the function  $R(t) = -33t^2 + 360t$ , where  $t$  represents the price of a ticket. The production cost,  $C$ , of the musical is represented by the function  $C(t) = 700 + 5t$ . What is the highest ticket price, to the *nearest dollar*, they can charge in order to *not* lose money on the event?
- 1)  $t = 3$
  - 2)  $t = 5$
  - 3)  $t = 8$
  - 4)  $t = 11$
- 454 What are the zeros of  $P(m) = (m^2 - 4)(m^2 + 1)$ ?
- 1) 2 and  $-2$ , only
  - 2) 2,  $-2$ , and  $-4$
  - 3)  $-4$ ,  $i$ , and  $-i$
  - 4) 2,  $-2$ ,  $i$ , and  $-i$
- 455 When factored completely,  $m^5 + m^3 - 6m$  is equivalent to
- 1)  $(m + 3)(m - 2)$
  - 2)  $(m^2 + 3m)(m^2 - 2)$
  - 3)  $m(m^4 + m^2 - 6)$
  - 4)  $m(m^2 + 3)(m^2 - 2)$

- 456 The function  $f(x) = \frac{x-3}{x^2+2x-8}$  is undefined when  $x$  equals
- 1) 2 or  $-4$
  - 2) 4 or  $-2$
  - 3) 3, only
  - 4) 2, only

- 457 The function  $f(x) = 2^{-0.25x} \cdot \sin\left(\frac{\pi}{2}x\right)$  represents a damped sound wave function. What is the average rate of change for this function on the interval  $[-7, 7]$ , to the *nearest hundredth*?
- 1)  $-3.66$
  - 2)  $-0.30$
  - 3)  $-0.26$
  - 4) 3.36

- 458 The formula below can be used to model which scenario?

$$a_1 = 3000$$

$$a_n = 0.80a_{n-1}$$

- 1) The first row of a stadium has 3000 seats, and each row thereafter has 80 more seats than the row in front of it.
  - 2) The last row of a stadium has 3000 seats, and each row before it has 80 fewer seats than the row behind it.
  - 3) A bank account starts with a deposit of \$3000, and each year it grows by 80%.
  - 4) The initial value of a specialty toy is \$3000, and its value each of the following years is 20% less.
- 459 Consider the system shown below.
- $$2x - y = 4$$
- $$(x + 3)^2 + y^2 = 8$$
- The two solutions of the system can be described as
- 1) both imaginary
  - 2) both irrational
  - 3) both rational
  - 4) one rational and one irrational

- 460 What does  $\left(\frac{-54x^9}{y^4}\right)^{\frac{2}{3}}$  equal?
- $\frac{9ix^6\sqrt[3]{4}}{y\sqrt[3]{y^2}}$
  - $\frac{9ix^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$
  - $\frac{9x^6\sqrt[3]{4}}{y\sqrt[3]{y}}$
  - $\frac{9x^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$
- 461 Which equation represents a parabola with a focus of (0,4) and a directrix of  $y = 2$ ?
- $y = x^2 + 3$
  - $y = -x^2 + 1$
  - $y = \frac{x^2}{2} + 3$
  - $y = \frac{x^2}{4} + 3$
- 462 Which expression has been rewritten correctly to form a true statement?
- $(x+2)^2 + 2(x+2) - 8 = (x+6)x$
  - $x^4 + 4x^2 + 9x^2y^2 - 36y^2 = (x+3y)^2(x-2)^2$
  - $x^3 + 3x^2 - 4xy^2 - 12y^2 = (x-2y)(x+3)^2$
  - $(x^2-4)^2 - 5(x^2-4) - 6 = (x^2-7)(x^2-6)$
- 463 Jasmine decides to put \$100 in a savings account each month. The account pays 3% annual interest, compounded monthly. How much money,  $S$ , will Jasmine have after one year?
- $S = 100(1.03)^{12}$
  - $S = \frac{100 - 100(1.0025)^{12}}{1 - 1.0025}$
  - $S = 100(1.0025)^{12}$
  - $S = \frac{100 - 100(1.03)^{12}}{1 - 1.03}$
- 464 The equation  $4x^2 - 24x + 4y^2 + 72y = 76$  is equivalent to
- $4(x-3)^2 + 4(y+9)^2 = 76$
  - $4(x-3)^2 + 4(y+9)^2 = 121$
  - $4(x-3)^2 + 4(y+9)^2 = 166$
  - $4(x-3)^2 + 4(y+9)^2 = 436$
- 465 As  $x$  increases from 0 to  $\frac{\pi}{2}$ , the graph of the equation  $y = 2 \tan x$  will
- increase from 0 to 2
  - decrease from 0 to -2
  - increase without limit
  - decrease without limit
- 466 The inverse of the function  $f(x) = \frac{x+1}{x-2}$  is
- $f^{-1}(x) = \frac{x+1}{x+2}$
  - $f^{-1}(x) = \frac{2x+1}{x-1}$
  - $f^{-1}(x) = \frac{x+1}{x-2}$
  - $f^{-1}(x) = \frac{x-1}{x+1}$
- 467 Given  $f(9) = -2$ , which function can be used to generate the sequence  $-8, -7.25, -6.5, -5.75, \dots$ ?
- $f(n) = -8 + 0.75n$
  - $f(n) = -8 - 0.75(n-1)$
  - $f(n) = -8.75 + 0.75n$
  - $f(n) = -0.75 + 8(n-1)$
- 468 A recursive formula for the sequence  $18, 9, 4.5, \dots$  is
- $g_1 = 18$   
 $g_n = \frac{1}{2}g_{n-1}$
  - $g_n = 18\left(\frac{1}{2}\right)^{n-1}$
  - $g_1 = 18$   
 $g_n = 2g_{n-1}$
  - $g_n = 18(2)^{n-1}$

Algebra II Multiple Choice Regents Exam Questions

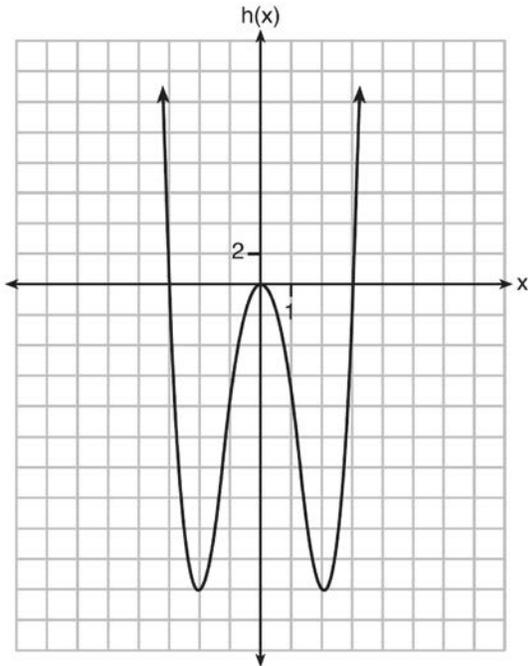
[www.jmap.org](http://www.jmap.org)

- 469 If  $p(x) = 2\ln(x) - 1$  and  $m(x) = \ln(x + 6)$ , then what is the solution for  $p(x) = m(x)$ ?
- 1) 1.65
  - 2) 3.14
  - 3) 5.62
  - 4) no solution
- 470 A public opinion poll was conducted on behalf of Mayor Ortega's reelection campaign shortly before the election. 264 out of 550 likely voters said they would vote for Mayor Ortega; the rest said they would vote for his opponent. Which statement is *least* appropriate to make, according to the results of the poll?
- 1) There is a 48% chance that Mayor Ortega will win the election.
  - 2) The point estimate ( $\hat{p}$ ) of voters who will vote for Mayor Ortega is 48%.
  - 3) It is most likely that between 44% and 52% of voters will vote for Mayor Ortega.
  - 4) Due to the margin of error, an inference cannot be made regarding whether Mayor Ortega or his opponent is most likely to win the election.
- 471 Which equation has  $1 - i$  as a solution?
- 1)  $x^2 + 2x - 2 = 0$
  - 2)  $x^2 + 2x + 2 = 0$
  - 3)  $x^2 - 2x - 2 = 0$
  - 4)  $x^2 - 2x + 2 = 0$
- 472 Kristin wants to increase her running endurance. According to experts, a gradual mileage increase of 10% per week can reduce the risk of injury. If Kristin runs 8 miles in week one, which expression can help her find the total number of miles she will have run over the course of her 6-week training program?
- 1)  $\sum_{n=1}^6 8(1.10)^{n-1}$
  - 2)  $\sum_{n=1}^6 8(1.10)^n$
  - 3)  $\frac{8 - 8(1.10)^6}{0.90}$
  - 4)  $\frac{8 - 8(0.10)^n}{1.10}$
- 473 The expression  $\frac{x^3 + 2x^2 + x + 6}{x + 2}$  is equivalent to
- 1)  $x^2 + 3$
  - 2)  $x^2 + 1 + \frac{4}{x + 2}$
  - 3)  $2x^2 + x + 6$
  - 4)  $2x^2 + 1 + \frac{4}{x + 2}$
- 474 When  $g(x) = \frac{2}{x + 2}$  and  $h(x) = \log(x + 1) + 3$  are graphed on the same set of axes, which coordinates best approximate their point of intersection?
- 1)  $(-0.9, 1.8)$
  - 2)  $(-0.9, 1.9)$
  - 3)  $(1.4, 3.3)$
  - 4)  $(1.4, 3.4)$
- 475 Which statement(s) about statistical studies is true?
- I. A survey of all English classes in a high school would be a good sample to determine the number of hours students throughout the school spend studying.
  - II. A survey of all ninth graders in a high school would be a good sample to determine the number of student parking spaces needed at that high school.
  - III. A survey of all students in one lunch period in a high school would be a good sample to determine the number of hours adults spend on social media websites.
  - IV. A survey of all Calculus students in a high school would be a good sample to determine the number of students throughout the school who don't like math.
- 1) I, only
  - 2) II, only
  - 3) I and III
  - 4) III and IV
- 476 Given the parent function  $p(x) = \cos x$ , which phrase best describes the transformation used to obtain the graph of  $g(x) = \cos(x + a) - b$ , if  $a$  and  $b$  are positive constants?
- 1) right  $a$  units, up  $b$  units
  - 2) right  $a$  units, down  $b$  units
  - 3) left  $a$  units, up  $b$  units
  - 4) left  $a$  units, down  $b$  units

477 Functions  $f$ ,  $g$ , and  $h$  are given below.

$$f(x) = \sin(2x)$$

$$g(x) = f(x) + 1$$



Which statement is true about functions  $f$ ,  $g$ , and  $h$ ?

- 1)  $f(x)$  and  $g(x)$  are odd,  $h(x)$  is even.
- 2)  $f(x)$  and  $g(x)$  are even,  $h(x)$  is odd.
- 3)  $f(x)$  is odd,  $g(x)$  is neither,  $h(x)$  is even.
- 4)  $f(x)$  is even,  $g(x)$  is neither,  $h(x)$  is odd.

478 The eighth and tenth terms of a sequence are 64 and 100. If the sequence is either arithmetic or geometric, the ninth term can *not* be

- 1) -82
- 2) -80
- 3) 80
- 4) 82

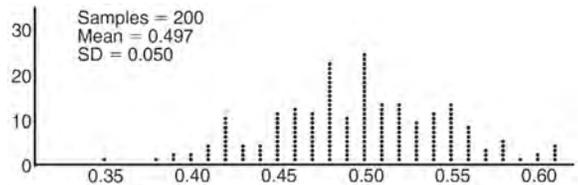
479 Given  $i$  is the imaginary unit,  $(2 - yi)^2$  in simplest form is

- 1)  $y^2 - 4yi + 4$
- 2)  $-y^2 - 4yi + 4$
- 3)  $-y^2 + 4$
- 4)  $y^2 + 4$

480 A solution of the equation  $2x^2 + 3x + 2 = 0$  is

- 1)  $-\frac{3}{4} + \frac{1}{4}i\sqrt{7}$
- 2)  $-\frac{3}{4} + \frac{1}{4}i$
- 3)  $-\frac{3}{4} + \frac{1}{4}\sqrt{7}$
- 4)  $\frac{1}{2}$

481 Anne has a coin. She does not know if it is a fair coin. She flipped the coin 100 times and obtained 73 heads and 27 tails. She ran a computer simulation of 200 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Given the results of her coin flips and of her computer simulation, which statement is most accurate?

- 1) 73 of the computer's next 100 coin flips will be heads.
- 2) 50 of her next 100 coin flips will be heads.
- 3) Her coin is not fair.
- 4) Her coin is fair.

482 If the terminal side of angle  $\theta$ , in standard position, passes through point  $(-4, 3)$ , what is the numerical value of  $\sin \theta$ ?

- 1)  $\frac{3}{5}$
- 2)  $\frac{4}{5}$
- 3)  $-\frac{3}{5}$
- 4)  $-\frac{4}{5}$

- 483 Iridium-192 is an isotope of iridium and has a half-life of 73.83 days. If a laboratory experiment begins with 100 grams of Iridium-192, the number of grams,  $A$ , of Iridium-192 present after  $t$  days

would be  $A = 100\left(\frac{1}{2}\right)^{\frac{t}{73.83}}$ . Which equation

approximates the amount of Iridium-192 present after  $t$  days?

- 1)  $A = 100\left(\frac{73.83}{2}\right)^t$
  - 2)  $A = 100\left(\frac{1}{147.66}\right)^t$
  - 3)  $A = 100(0.990656)^t$
  - 4)  $A = 100(0.116381)^t$
- 484 A student studying public policy created a model for the population of Detroit, where the population decreased 25% over a decade. He used the model  $P = 714(0.75)^d$ , where  $P$  is the population, in thousands,  $d$  decades after 2010. Another student, Suzanne, wants to use a model that would predict the population after  $y$  years. Suzanne's model is best represented by
- 1)  $P = 714(0.6500)^y$
  - 2)  $P = 714(0.8500)^y$
  - 3)  $P = 714(0.9716)^y$
  - 4)  $P = 714(0.9750)^y$

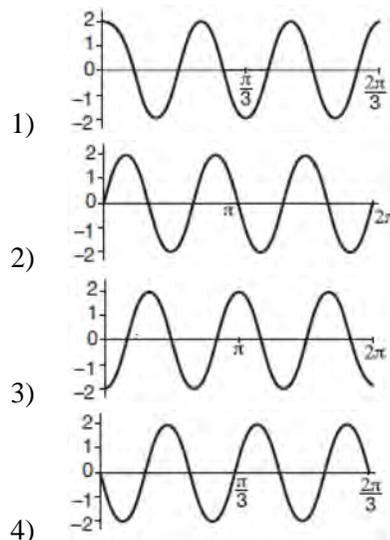
- 485 If  $n = \sqrt{a^5}$  and  $m = a$ , where  $a > 0$ , an expression for  $\frac{n}{m}$  could be

- 1)  $a^{\frac{5}{2}}$
- 2)  $a^4$
- 3)  $\sqrt[3]{a^2}$
- 4)  $\sqrt{a^3}$

- 486 What is the completely factored form of  $k^4 - 4k^2 + 8k^3 - 32k + 12k^2 - 48$ ?

- 1)  $(k - 2)(k - 2)(k + 3)(k + 4)$
- 2)  $(k - 2)(k - 2)(k + 6)(k + 2)$
- 3)  $(k + 2)(k - 2)(k + 3)(k + 4)$
- 4)  $(k + 2)(k - 2)(k + 6)(k + 2)$

- 487 Which graph represents a cosine function with no horizontal shift, an amplitude of 2, and a period of  $\frac{2\pi}{3}$ ?



- 488 What is the solution set of the equation

$$\frac{3x + 25}{x + 7} - 5 = \frac{3}{x}?$$

- 1)  $\left\{\frac{3}{2}, 7\right\}$
- 2)  $\left\{\frac{7}{2}, -3\right\}$
- 3)  $\left\{-\frac{3}{2}, 7\right\}$
- 4)  $\left\{-\frac{7}{2}, -3\right\}$

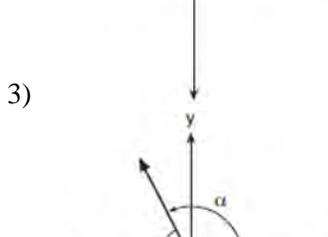
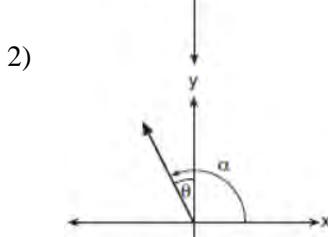
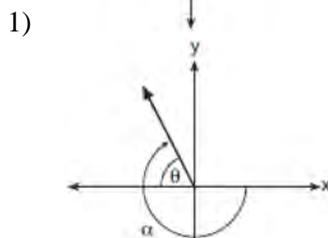
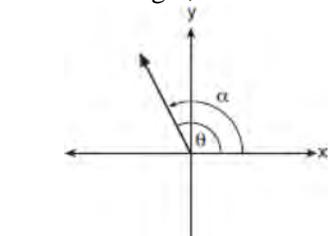
- 489 Which factorization is *incorrect*?

- 1)  $4k^2 - 49 = (2k + 7)(2k - 7)$
- 2)  $a^3 - 8b^3 = (a - 2b)(a^2 + 2ab + 4b^2)$
- 3)  $m^3 + 3m^2 - 4m + 12 = (m - 2)^2(m + 3)$
- 4)  $t^3 + 5t^2 + 6t + t^2 + 5t + 6 = (t + 1)(t + 2)(t + 3)$

Algebra II Multiple Choice Regents Exam Questions

[www.jmap.org](http://www.jmap.org)

- 490 Which diagram represents an angle,  $\alpha$ , measuring  $\frac{13\pi}{20}$  radians drawn in standard position, and its reference angle,  $\theta$ ?



- 491 The lifespan of a 60-watt lightbulb produced by a company is normally distributed with a mean of 1450 hours and a standard deviation of 8.5 hours. If a 60-watt lightbulb produced by this company is selected at random, what is the probability that its lifespan will be between 1440 and 1465 hours?
- 1) 0.3803
  - 2) 0.4612
  - 3) 0.8415
  - 4) 0.9612

- 492 In 2013, approximately 1.6 million students took the Critical Reading portion of the SAT exam. The mean score, the modal score, and the standard deviation were calculated to be 496, 430, and 115, respectively. Which interval reflects 95% of the Critical Reading scores?

- 1)  $430 \pm 115$
- 2)  $430 \pm 230$
- 3)  $496 \pm 115$
- 4)  $496 \pm 230$

- 493 Which equation represents a parabola with the focus at  $(0, -1)$  and the directrix of  $y = 1$ ?

- 1)  $x^2 = -8y$
- 2)  $x^2 = -4y$
- 3)  $x^2 = 8y$
- 4)  $x^2 = 4y$

- 494 What is the solution, if any, of the equation

$$\frac{2}{x+3} - \frac{3}{4-x} = \frac{2x-2}{x^2-x-12}?$$

- 1)  $-1$
- 2)  $-5$
- 3) all real numbers
- 4) no real solution

- 495 Given  $f^{-1}(x) = -\frac{3}{4}x + 2$ , which equation represents  $f(x)$ ?

- 1)  $f(x) = \frac{4}{3}x - \frac{8}{3}$
- 2)  $f(x) = -\frac{4}{3}x + \frac{8}{3}$
- 3)  $f(x) = \frac{3}{4}x - 2$
- 4)  $f(x) = -\frac{3}{4}x + 2$

- 496 Which expression is equivalent to  $(3k - 2i)^2$ , where  $i$  is the imaginary unit?

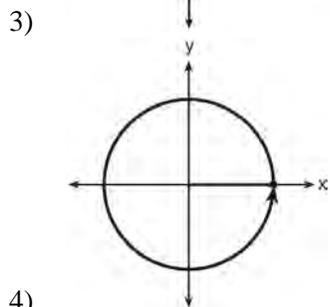
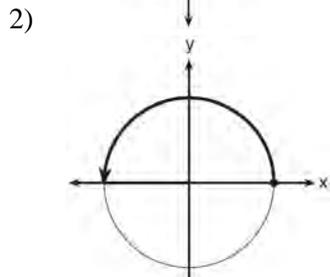
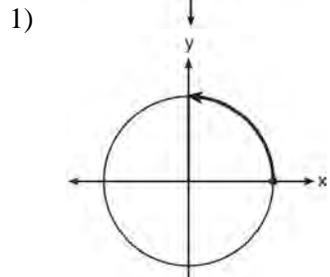
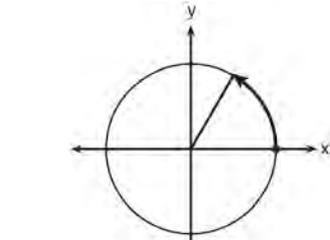
- 1)  $9k^2 - 4$
- 2)  $9k^2 + 4$
- 3)  $9k^2 - 12ki - 4$
- 4)  $9k^2 - 12ki + 4$

Algebra II Multiple Choice Regents Exam Questions

[www.jmap.org](http://www.jmap.org)

- 497 The voltage used by most households can be modeled by a sine function. The maximum voltage is 120 volts, and there are 60 cycles *every second*. Which equation best represents the value of the voltage as it flows through the electric wires, where  $t$  is time in seconds?
- 1)  $V = 120\sin(t)$
  - 2)  $V = 120\sin(60t)$
  - 3)  $V = 120\sin(60\pi t)$
  - 4)  $V = 120\sin(120\pi t)$
- 498 The solution set for the equation  $\sqrt{56-x} = x$  is
- 1)  $\{-8, 7\}$
  - 2)  $\{-7, 8\}$
  - 3)  $\{7\}$
  - 4)  $\{ \}$
- 499 To solve  $\frac{2x}{x-2} - \frac{11}{x} = \frac{8}{x^2-2x}$ , Ren multiplied both sides by the least common denominator. Which statement is true?
- 1) 2 is an extraneous solution.
  - 2)  $\frac{7}{2}$  is an extraneous solution.
  - 3) 0 and 2 are extraneous solutions.
  - 4) This equation does not contain any extraneous solutions.
- 500 A manufacturing company has developed a cost model,  $C(x) = 0.15x^3 + 0.01x^2 + 2x + 120$ , where  $x$  is the number of items sold, in thousands. The sales price can be modeled by  $S(x) = 30 - 0.01x$ . Therefore, revenue is modeled by  $R(x) = x \cdot S(x)$ . The company's profit,  $P(x) = R(x) - C(x)$ , could be modeled by
- 1)  $0.15x^3 + 0.02x^2 - 28x + 120$
  - 2)  $-0.15x^3 - 0.02x^2 + 28x - 120$
  - 3)  $-0.15x^3 + 0.01x^2 - 2.01x - 120$
  - 4)  $-0.15x^3 + 32x + 120$
- 501 To the *nearest tenth*, the value of  $x$  that satisfies  $2^x = -2x + 11$  is
- 1) 2.5
  - 2) 2.6
  - 3) 5.8
  - 4) 5.9
- 502 A rabbit population doubles every 4 weeks. There are currently five rabbits in a restricted area. If  $t$  represents the time, in weeks, and  $P(t)$  is the population of rabbits with respect to time, about how many rabbits will there be in 98 days?
- 1) 56
  - 2) 152
  - 3) 3688
  - 4) 81,920
- 503 The roots of the equation  $x^2 + 2x + 5 = 0$  are
- 1)  $-3$  and  $1$
  - 2)  $-1$ , only
  - 3)  $-1 + 2i$  and  $-1 - 2i$
  - 4)  $-1 + 4i$  and  $-1 - 4i$
- 504 Given that  $\sin^2 \theta + \cos^2 \theta = 1$  and  $\sin \theta = -\frac{\sqrt{2}}{5}$ , what is a possible value of  $\cos \theta$ ?
- 1)  $\frac{5 + \sqrt{2}}{5}$
  - 2)  $\frac{\sqrt{23}}{5}$
  - 3)  $\frac{3\sqrt{3}}{5}$
  - 4)  $\frac{\sqrt{35}}{5}$
- 505 A polynomial equation of degree three,  $p(x)$ , is used to model the volume of a rectangular box. The graph of  $p(x)$  has  $x$  intercepts at  $-2$ ,  $10$ , and  $14$ . Which statements regarding  $p(x)$  could be true?
- A. The equation of  $p(x) = (x - 2)(x + 10)(x + 14)$ .
  - B. The equation of  $p(x) = -(x + 2)(x - 10)(x - 14)$ .
  - C. The maximum volume occurs when  $x = 10$ .
  - D. The maximum volume of the box is approximately 56.
- 1) A and C
  - 2) A and D
  - 3) B and C
  - 4) B and D

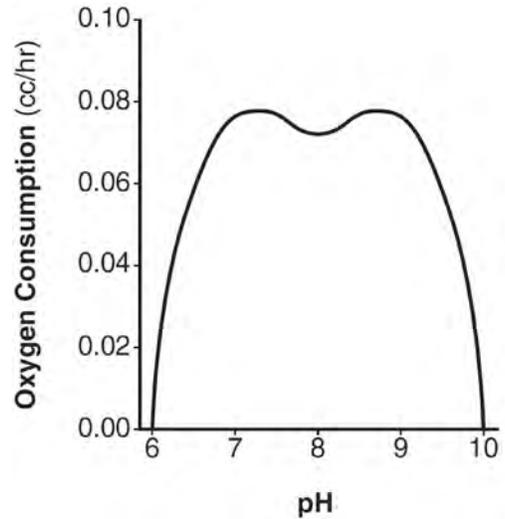
506 Which diagram shows an angle rotation of 1 radian on the unit circle?



507 An equation to represent the value of a car after  $t$  months of ownership is  $v = 32,000(0.81)^{\frac{t}{12}}$ . Which statement is *not* correct?

- 1) The car lost approximately 19% of its value each month.
- 2) The car maintained approximately 98% of its value each month.
- 3) The value of the car when it was purchased was \$32,000.
- 4) The value of the car 1 year after it was purchased was \$25,920.

508 There was a study done on oxygen consumption of snails as a function of pH, and the result was a degree 4 polynomial function whose graph is shown below.



Which statement about this function is *incorrect*?

- 1) The degree of the polynomial is even.
- 2) There is a positive leading coefficient.
- 3) At two pH values, there is a relative maximum value.
- 4) There are two intervals where the function is decreasing.

509 Cheap and Fast gas station is conducting a consumer satisfaction survey. Which method of collecting data would most likely lead to a biased sample?

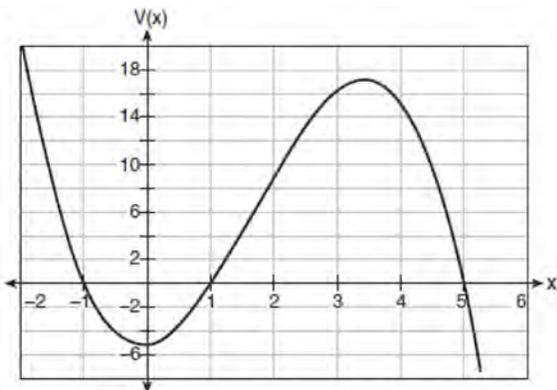
- 1) interviewing every 5th customer to come into the station
- 2) interviewing customers chosen at random by a computer at the checkout
- 3) interviewing customers who call an 800 number posted on the customers' receipts
- 4) interviewing every customer who comes into the station on a day of the week chosen at random out of a hat

Algebra II Multiple Choice Regents Exam Questions

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- 510 Which scenario is best described as an observational study?
- 1) For a class project, students in Health class ask every tenth student entering the school if they eat breakfast in the morning.
  - 2) A social researcher wants to learn whether or not there is a link between attendance and grades. She gathers data from 15 school districts.
  - 3) A researcher wants to learn whether or not there is a link between children's daily amount of physical activity and their overall energy level. During lunch at the local high school, she distributed a short questionnaire to students in the cafeteria.
  - 4) Sixty seniors taking a course in Advanced Algebra Concepts are randomly divided into two classes. One class uses a graphing calculator all the time, and the other class never uses graphing calculators. A guidance counselor wants to determine whether there is a link between graphing calculator use and students' final exam grades.

- 511 A cardboard box manufacturing company is building boxes with length represented by  $x + 1$ , width by  $5 - x$ , and height by  $x - 1$ . The volume of the box is modeled by the function below.



Over which interval is the volume of the box changing at the fastest average rate?

- 1)  $[1, 2]$
- 2)  $[1, 3.5]$
- 3)  $[1, 5]$
- 4)  $[0, 3.5]$

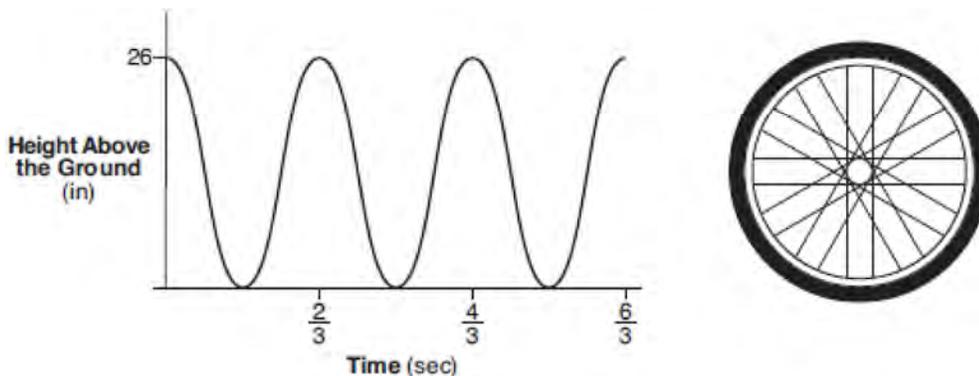
- 512 The heights of women in the United States are normally distributed with a mean of 64 inches and a standard deviation of 2.75 inches. The percent of women whose heights are between 64 and 69.5 inches, to the *nearest whole percent*, is
- 1) 6
  - 2) 48
  - 3) 68
  - 4) 95
- 513 A ball is dropped from a height of 32 feet. It bounces and rebounds 80% of the height from which it was falling. What is the total downward distance, in feet, the ball traveled up to the 12th bounce?
- 1) 29
  - 2) 58
  - 3) 120
  - 4) 149
- 514 The zeros for  $f(x) = x^4 - 4x^3 - 9x^2 + 36x$  are
- 1)  $\{0, \pm 3, 4\}$
  - 2)  $\{0, 3, 4\}$
  - 3)  $\{0, \pm 3, -4\}$
  - 4)  $\{0, 3, -4\}$

**Algebra II 2 Point Regents Exam Questions**

515 The table below shows the results of gender and music preference. Based on these data, determine if the events "the person is female" and "the person prefers classic rock" are independent of each other. Justify your answer.

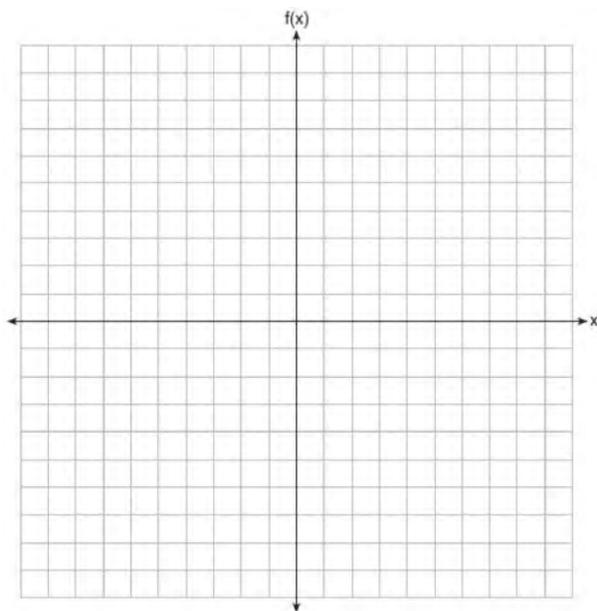
|        | Rap | Techno | Classic Rock | Classical |
|--------|-----|--------|--------------|-----------|
| Male   | 39  | 17     | 42           | 12        |
| Female | 17  | 37     | 36           | 15        |

516 The graph below represents the height above the ground,  $h$ , in inches, of a point on a triathlete's bike wheel during a training ride in terms of time,  $t$ , in seconds.



Identify the period of the graph and describe what the period represents in this context.

517 On the grid below, graph the function  $f(x) = x^3 - 6x^2 + 9x + 6$  on the domain  $-1 \leq x \leq 4$ .



518 At Andrew Jackson High School, students are only allowed to enroll in AP U.S. History if they have already taken AP World History or AP European History. Out of 825 incoming seniors, 165 took AP World History, 66 took AP European History, and 33 took both. Given this information, determine the probability a randomly selected incoming senior is allowed to enroll in AP U.S. History.

519 Simplify  $xi(i - 7i)^2$ , where  $i$  is the imaginary unit.

520 The height, above ground, of a Ferris wheel car can be modeled by the function

$$h(t) = -103.5 \cos\left(\frac{2\pi t}{5}\right) + 108.5$$

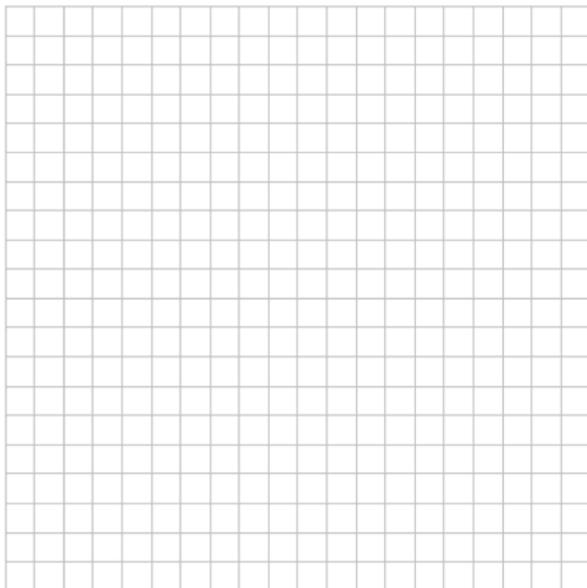
where  $h$  is

measured in feet and  $t$  is measured in minutes. State the period of the function and describe what the period represents in this context.

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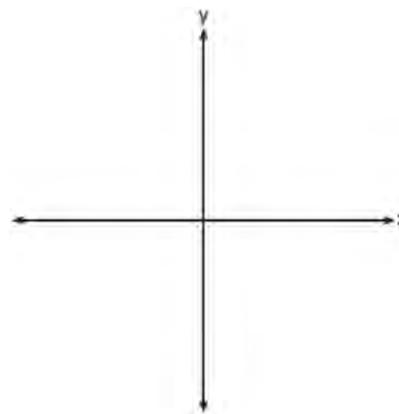
- 521 Using the identity  $\sin^2 \theta + \cos^2 \theta = 1$ , find the value of  $\tan \theta$ , to the *nearest hundredth*, if  $\cos \theta$  is  $-0.7$  and  $\theta$  is in Quadrant II.
- 522 On July 21, 2016, the water level in Puget Sound, WA reached a high of 10.1 ft at 6 a.m. and a low of  $-2$  ft at 12:30 p.m. Across the country in Long Island, NY, Shinnecock Bay's water level reached a high of 2.5 ft at 10:42 p.m. and a low of  $-0.1$  ft at 5:31 a.m. The water levels of both locations are affected by the tides and can be modeled by sinusoidal functions. Determine the difference in amplitudes, in feet, for these two locations.
- 523 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and  $-2$ .



- 524 The volume of air in a person's lungs, as the person breathes in and out, can be modeled by a sine graph. A scientist is studying the differences in this volume for people at rest compared to people told to take a deep breath. When examining the graphs, should the scientist focus on the amplitude, period, or midline? Explain your choice.
- 525 Algebraically determine the zeros of the function below.

$$r(x) = 3x^3 + 12x^2 - 3x - 12$$

- 526 Factor  $x^3 + 4x^2 - 9x - 36$  completely.
- 527 An initial investment of \$1000 reaches a value,  $V(t)$ , according to the model  $V(t) = 1000(1.01)^{4t}$ , where  $t$  is the time in years. Determine the average rate of change, to the *nearest dollar per year*, of this investment from year 2 to year 7.
- 528 Given  $a > 0$ , solve the equation  $a^{x+1} = \sqrt[3]{a^2}$  for  $x$  algebraically.
- 529 The zeros of a quartic polynomial function are 2,  $-2$ , 4, and  $-4$ . Use the zeros to construct a possible sketch of the function, on the set of axes below.



- 530 Elizabeth tried to find the product of  $(2 + 4i)$  and  $(3 - i)$ , and her work is shown below.

$$\begin{aligned} &(2 + 4i)(3 - i) \\ &= 6 - 2i + 12i - 4i^2 \\ &= 6 + 10i - 4i^2 \\ &= 6 + 10i - 4(1) \\ &= 6 + 10i - 4 \\ &= 2 + 10i \end{aligned}$$

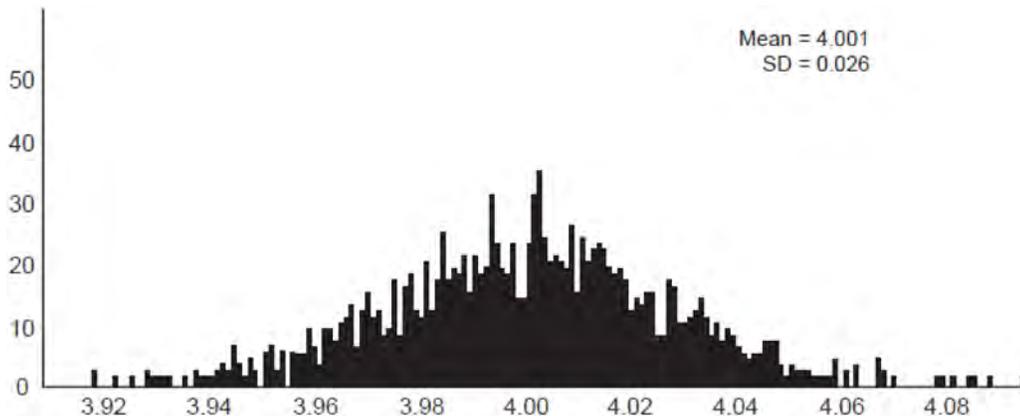
Identify the error in the process shown and determine the correct product of  $(2 + 4i)$  and  $(3 - i)$ .

- 531 Algebraically solve for  $x$ :  $\frac{-3}{x+3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$

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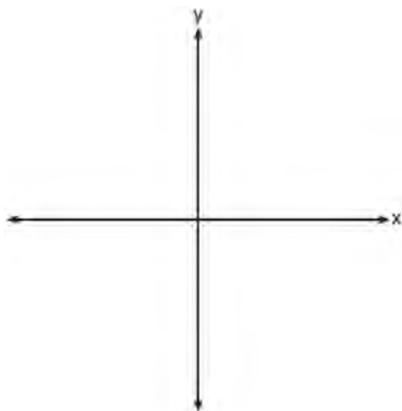
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- 532 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of 4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.



Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

- 533 The polynomial function  $g(x) = x^3 + ax^2 - 5x + 6$  has a factor of  $(x - 3)$ . Determine the value of  $a$ .
- 534 Given events  $A$  and  $B$ , such that  $P(A) = 0.6$ ,  $P(B) = 0.5$ , and  $P(A \cup B) = 0.8$ , determine whether  $A$  and  $B$  are independent or dependent.
- 535 Sketch a graph of polynomial  $P(x)$ , given the criteria below:
- $P(x)$  has zeros only at  $-5, 1$ , and  $4$
  - As  $x \rightarrow \infty, P(x) \rightarrow -\infty$
  - As  $x \rightarrow -\infty, P(x) \rightarrow -\infty$
- 536 Given  $i$  is the imaginary unit, simplify  $(5xi^3 - 4i)^2$  as a polynomial in standard form.
- 537 Solve the following system of equations algebraically.  $x^2 + y^2 = 400$   
 $y = x - 28$
- 538 The explicit formula  $a_n = 6 + 6n$  represents the number of seats in each row in a movie theater, where  $n$  represents the row number. Rewrite this formula in recursive form.
- 539 Solve algebraically for  $x$  to the *nearest thousandth*:  $2e^{0.49x} = 15$



- 540 Mrs. Jones had hundreds of jelly beans in a bag that contained equal numbers of six different flavors. Her student randomly selected four jelly beans and they were all black licorice. Her student complained and said "What are the odds I got all of that kind?" Mrs. Jones replied, "simulate rolling a die 250 times and tell me if four black licorice jelly beans is unusual." Explain how this simulation could be used to solve the problem.

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541 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, .... Write a recursive formula for Candy's sequence. Determine the eighth term in Candy's sequence.

542 A fruit fly population can be modeled by the equation  $P = 10(1.27)^t$ , where  $P$  represents the number of fruit flies after  $t$  days. What is the average rate of change of the population, rounded to the nearest hundredth, over the interval  $[0, 10.5]$ ? Include appropriate units in your answer.

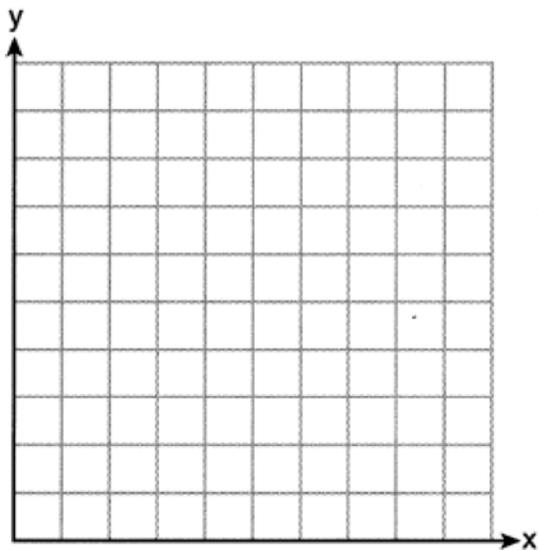
543 Determine for which polynomial(s)  $(x + 2)$  is a factor. Explain your answer.

$$P(x) = x^4 - 3x^3 - 16x - 12$$

$$Q(x) = x^3 - 3x^2 - 16x - 12$$

544 For  $x \neq 0$  and  $y \neq 0$ ,  $\sqrt[3]{81x^{15}y^9} = 3^a x^5 y^3$ . Determine the value of  $a$ .

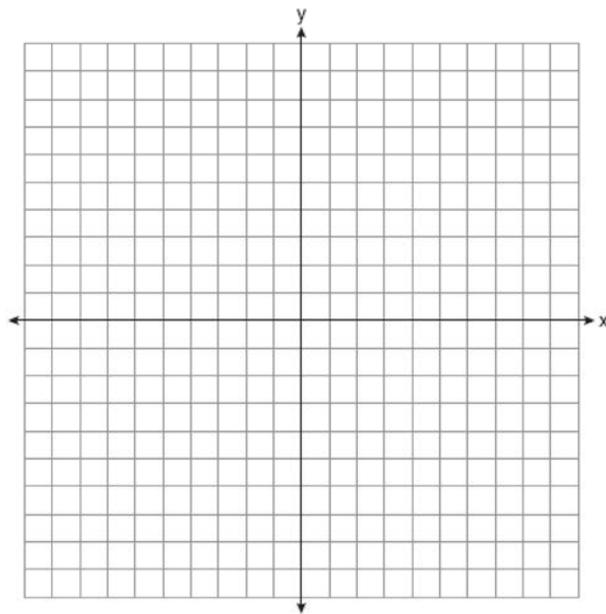
545 Graph  $y = 2\cos\left(\frac{1}{2}x\right) + 5$  on the interval  $[0, 2\pi]$ , using the axes below.



546 Explain why  $81^{\frac{3}{4}}$  equals 27.

547 Determine if  $x - 5$  is a factor of  $2x^3 - 4x^2 - 7x - 10$ . Explain your answer.

548 On the axes below, graph one cycle of a cosine function with amplitude 3, period  $\frac{\pi}{2}$ , midline  $y = -1$ , and passing through the point  $(0, 2)$ .



549 Kenzie believes that for  $x \geq 0$ , the expression  $\left(\sqrt[7]{x^2}\right)\left(\sqrt[5]{x^3}\right)$  is equivalent to  $\sqrt[35]{x^6}$ . Is she correct? Justify your response algebraically.

550 Factor completely over the set of integers:  
 $-2x^4 + x^3 + 18x^2 - 9x$

551 A brewed cup of coffee contains 130 mg of caffeine. The half-life of caffeine in the bloodstream is 5.5 hours. Write a function,  $C(t)$  to represent the amount of caffeine in the bloodstream  $t$  hours after drinking one cup of coffee.

552 Explain what a rational exponent, such as  $\frac{5}{2}$  means.

Use this explanation to evaluate  $9^{\frac{5}{2}}$ .

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553 Algebraically determine whether the function  $j(x) = x^4 - 3x^2 - 4$  is odd, even, or neither.

554 The cost of a brand-new electric-hybrid vehicle is listed at \$33,400, and the average annual depreciation for the vehicle is 15%. The car's value can be modeled by the function  $V(x) = 33,400(0.85)^x$ , where  $x$  represents the years since purchase. Julia and Jacob have each written a function that is equivalent to the original.

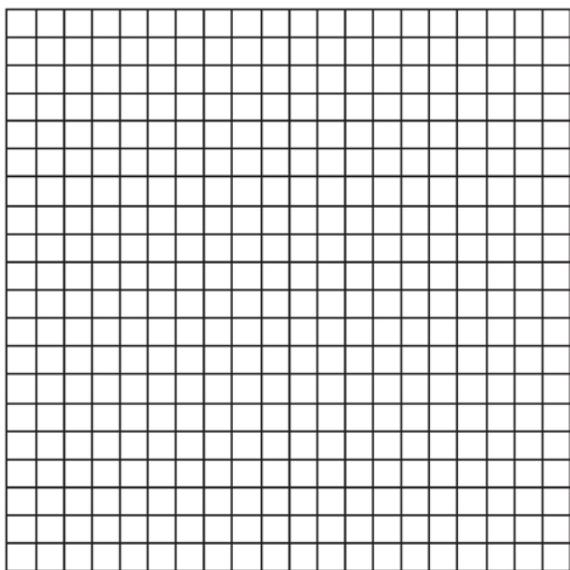
Jacob's function:  $V(x) = 33,400(0.1422)^{\frac{1}{12}x}$

Julia's function:  $V(x) = 33,400(0.9865)^{12x}$

Whose function is correctly rewritten to reveal the approximate monthly depreciation rate? Justify your answer.

555 Explain how  $(-8)^{\frac{4}{3}}$  can be evaluated using properties of rational exponents to result in an integer answer.

556 The parabola  $y = -\frac{1}{20}(x - 3)^2 + 6$  has its focus at  $(3, 1)$ . Determine and state the equation of the directrix. (The use of the grid below is optional.)



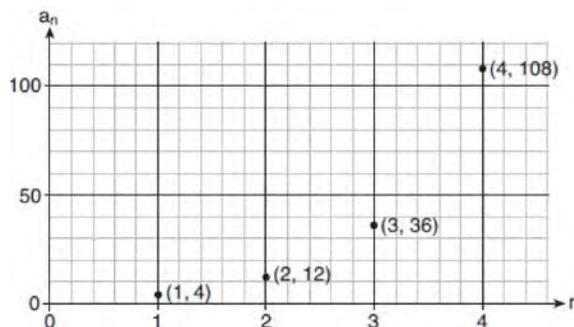
557 The directrix of the parabola  $12(y + 3) = (x - 4)^2$  has the equation  $y = -6$ . Find the coordinates of the focus of the parabola.

558 Use the properties of rational exponents to determine the value of  $y$  for the equation:

$$\frac{\sqrt[3]{x^8}}{(x^4)^{\frac{1}{3}}} = x^y, \quad x > 1$$

559 Solve the equation  $x^2 + 3x + 11 = 0$  algebraically. Express the answer in  $a + bi$  form.

560 Write a recursive formula,  $a_n$ , to describe the sequence graphed below.



561 Given  $f(x) = 3x^2 + 7x - 20$  and  $g(x) = x - 2$ , state the quotient and remainder of  $\frac{f(x)}{g(x)}$ , in the form  $q(x) + \frac{r(x)}{g(x)}$ .

562 Determine the solution of  $\sqrt{3x + 7} = x - 1$  algebraically.

563 Given the equal terms  $\sqrt[3]{x^5}$  and  $y^{\frac{5}{6}}$ , determine and state  $y$ , in terms of  $x$ .

564 Solve the equation  $2x^2 + 5x + 8 = 0$ . Express the answer in  $a + bi$  form.

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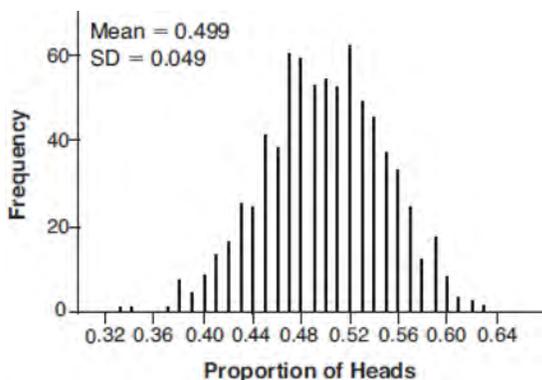
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- 565 A cup of coffee is left out on a countertop to cool. The table below represents the temperature,  $F(t)$ , in degrees Fahrenheit, of the coffee after it is left out for  $t$  minutes.

|        |     |     |     |     |      |      |
|--------|-----|-----|-----|-----|------|------|
| $t$    | 0   | 5   | 10  | 15  | 20   | 25   |
| $F(t)$ | 180 | 144 | 120 | 104 | 93.3 | 86.2 |

Based on these data, write an exponential regression equation,  $F(t)$ , to model the temperature of the coffee. Round all values to the *nearest thousandth*.

- 566 Robin flips a coin 100 times. It lands heads up 43 times, and she wonders if the coin is unfair. She runs a computer simulation of 750 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Do the results of the simulation provide strong evidence that Robin's coin is unfair? Explain your answer.

- 567 Given:  $h(x) = \frac{2}{9}x^3 + \frac{8}{9}x^2 - \frac{16}{13}x + 2$

$$k(x) = -|0.7x| + 5$$

State the solutions to the equation  $h(x) = k(x)$ , rounded to the *nearest hundredth*.

- 568 Algebraically solve for  $x$ :  $\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$

- 569 Factor the expression  $2x^3 - 3x^2 - 18x + 27$  completely.

- 570 Can  $f(x) = x^3 + 7$  be classified as an odd function? Justify your answer.

- 571 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$

$$y = 11 - 2x$$

- 572 Given the geometric series  $300 + 360 + 432 + 518.4 + \dots$ , write a geometric series formula,  $S_n$ , for the sum of the first  $n$  terms. Use the formula to find the sum of the first 10 terms, to the *nearest tenth*.

- 573 For the function  $f(x) = (x - 3)^3 + 1$ , find  $f^{-1}(x)$ .

- 574 Researchers in a local area found that the population of rabbits with an initial population of 20 grew continuously at the rate of 5% per month. The fox population had an initial value of 30 and grew continuously at the rate of 3% per month. Find, to the *nearest tenth of a month*, how long it takes for these populations to be equal.

- 575 The function  $M(t)$  represents the mass of radium over time,  $t$ , in years.

$$M(t) = 100e^{\frac{\left(\ln \frac{1}{2}\right)t}{1590}}$$

Determine if the function  $M(t)$  represents growth or decay. Explain your reasoning.

- 576 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

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577 Data collected about jogging from students with two older siblings are shown in the table below.

|                      | Neither Sibling Jogs | One Sibling Jogs | Both Siblings Jog |
|----------------------|----------------------|------------------|-------------------|
| Student Does Not Jog | 1168                 | 1823             | 1380              |
| Student Jogs         | 188                  | 416              | 400               |

Using these data, determine whether a student with two older siblings is more likely to jog if one sibling jogs or if both siblings jog. Justify your answer.

578 Rowan is training to run in a race. He runs 15 miles in the first week, and each week following, he runs 3% more than the week before. Using a geometric series formula, find the total number of miles Rowan runs over the first ten weeks of training, rounded to the *nearest thousandth*.

579 The Wells family is looking to purchase a home in a suburb of Rochester with a 30-year mortgage that has an annual interest rate of 3.6%. The house the family wants to purchase is \$152,500 and they will make a \$15,250 down payment and borrow the remainder. Use the formula below to determine their monthly payment, to the *nearest dollar*.

$$M = \frac{P \left( \frac{r}{12} \right) \left( 1 + \frac{r}{12} \right)^n}{\left( 1 + \frac{r}{12} \right)^n - 1}$$

$M$  = monthly payment

$P$  = amount borrowed

$r$  = annual interest rate

$n$  = total number of monthly payments

580 Describe the translations that map  $f(x) = \log x$  to  $g(x) = \log(x + 3) - 5$ .

581 Over the set of integers, factor the expression  $4x^3 - x^2 + 16x - 4$  completely.

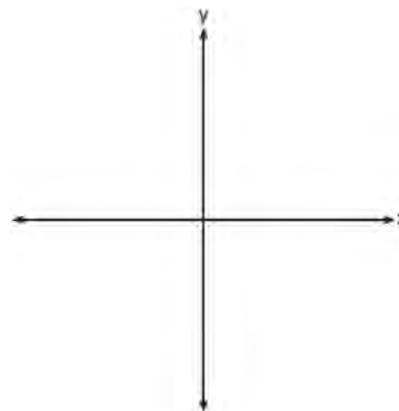
582 Solve algebraically for all values of  $x$ :

$$\frac{8}{x+5} - \frac{3}{x} = 5$$

583 Describe how a controlled experiment can be created to examine the effect of ingredient  $X$  in a toothpaste.

584 Write  $-\frac{1}{2}i^3(\sqrt{-9} - 4) - 3i^2$  in simplest  $a + bi$  form.

585 On the axes below, sketch a possible function  $p(x) = (x - a)(x - b)(x + c)$ , where  $a$ ,  $b$ , and  $c$  are positive,  $a > b$ , and  $p(x)$  has a positive  $y$ -intercept of  $d$ . Label all intercepts.



586 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

587 Solve algebraically for all values of  $x$ :

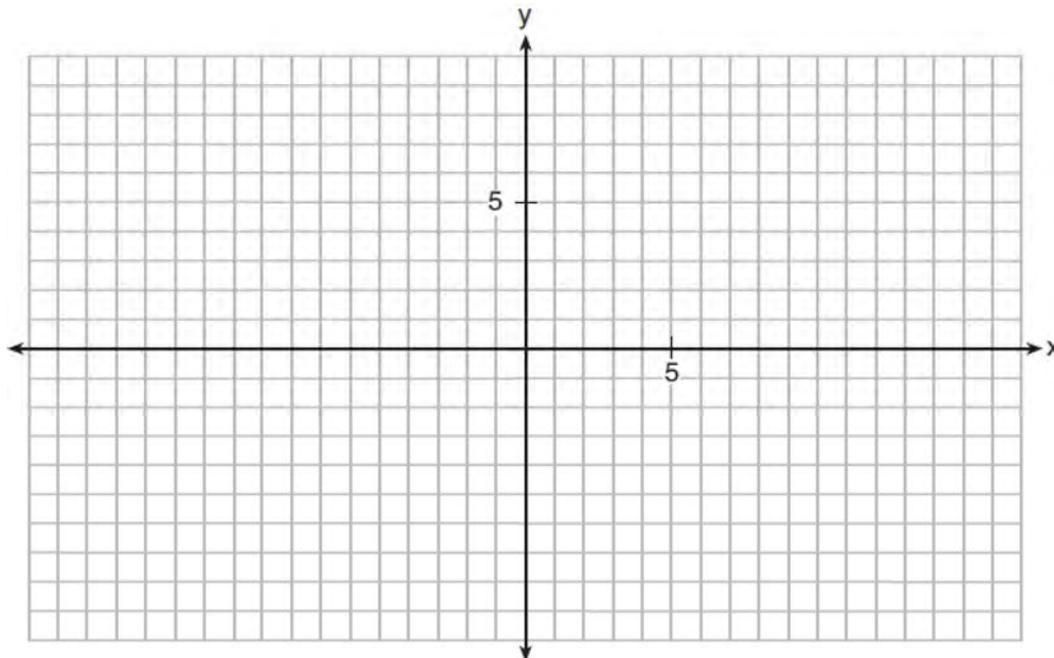
$$\sqrt{x-5} + x = 7$$

588 Determine if  $x + 4$  is a factor of  $2x^3 + 10x^2 + 4x - 16$ . Explain your answer.

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589 On the grid below, graph the function  $y = \log_2(x - 3) + 1$



590 A runner is using a nine-week training app to prepare for a "fun run." The table below represents the amount of the program completed,  $A$ , and the distance covered in a session,  $D$ , in miles.

|          |               |               |               |               |      |
|----------|---------------|---------------|---------------|---------------|------|
| <b>A</b> | $\frac{4}{9}$ | $\frac{5}{9}$ | $\frac{6}{9}$ | $\frac{8}{9}$ | 1    |
| <b>D</b> | 2             | 2             | 2.25          | 3             | 3.25 |

Based on these data, write an exponential regression equation, rounded to the *nearest thousandth*, to model the distance the runner is able to complete in a session as she continues through the nine-week program.

591 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

|                      |      |    |       |     |        |     |        |
|----------------------|------|----|-------|-----|--------|-----|--------|
| <b>Speed (mph)</b>   | 10   | 20 | 30    | 40  | 50     | 60  | 70     |
| <b>Distance (ft)</b> | 6.25 | 25 | 56.25 | 100 | 156.25 | 225 | 306.25 |

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph. Explain what this rate of change means as it relates to braking distance.

592 Write a recursive formula for the sequence 8, 20, 50, 125, 312.5, ...

594 Algebraically determine the values of  $x$  that satisfy the system of equations below:

$$y = x^2 + 8x - 5$$

$$y = 8x - 4$$

593 Completely factor the following expression:  
 $x^2 + 3xy + 3x^3 + y$

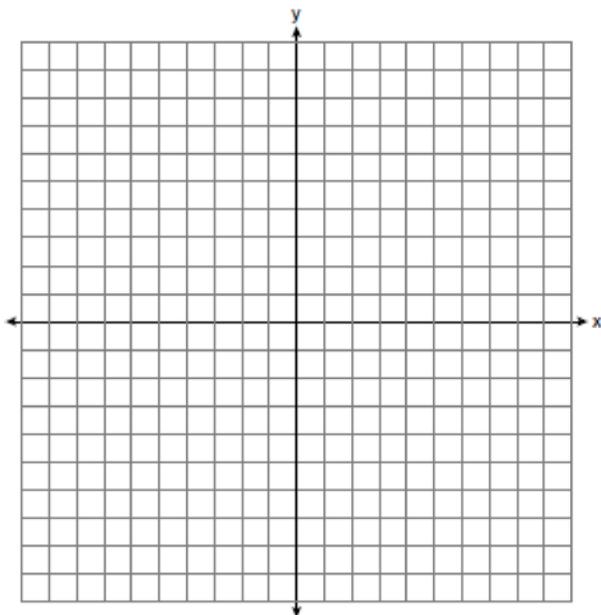
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- 595 For all values of  $x$  for which the expression is defined, write the expression below in simplest form.

$$\frac{2x^3 + x^2 - 18x - 9}{3x - x^2}$$

- 596 On the axes below, graph  $y = 3.2(1.8)^x$ .



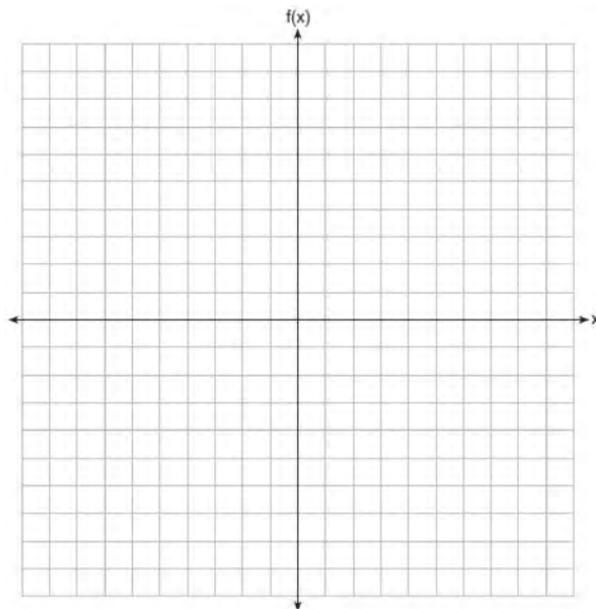
- 597 Justify why  $\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}}$  is equivalent to  $x^{-\frac{1}{12}}y^{\frac{2}{3}}$  using properties of rational exponents, where  $x \neq 0$  and  $y \neq 0$ .

- 598 Verify the following Pythagorean identity for all values of  $x$  and  $y$ :

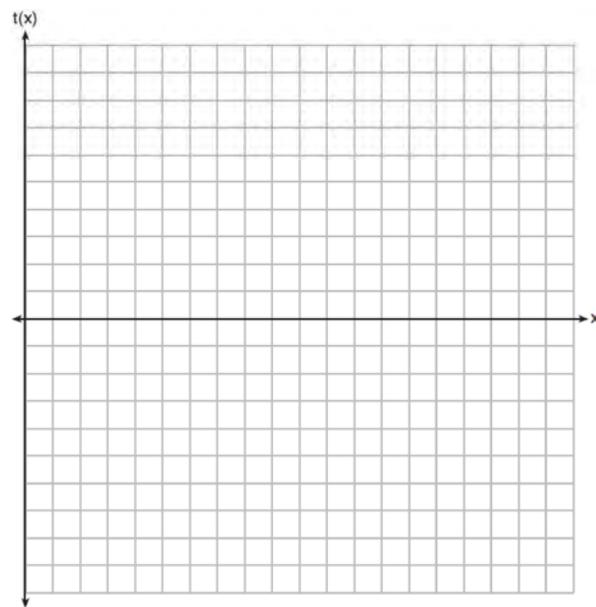
$$(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$$

- 599 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function  $p(t) = 2560e^{0.017185t}$ , where  $t$  is time in years after 1950 and  $p(t)$  is the population in millions. Determine the average rate of change of  $p(t)$  in millions of people per year, from  $4 \leq t \leq 8$ . Round your answer to the *nearest hundredth*.

- 600 Graph  $f(x) = \log_2(x + 6)$  on the set of axes below.



- 601 Graph  $t(x) = 3 \sin(2x) + 2$  over the domain  $[0, 2\pi]$  on the set of axes below.



- 602 Solve for  $x$ :  $\frac{1}{x} - \frac{1}{3} = -\frac{1}{3x}$

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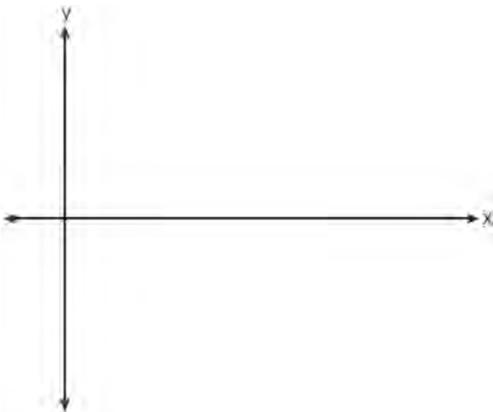
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603 Rewrite the expression  $(4x^2 + 5x)^2 - 5(4x^2 + 5x) - 6$  as a product of four linear factors.

604 Write  $\frac{x\sqrt{x^3}}{\sqrt[3]{x^5}}$  as a single term in simplest form, with a rational exponent.

605 Given  $P(A) = \frac{1}{3}$  and  $P(B) = \frac{5}{12}$ , where  $A$  and  $B$  are independent events, determine  $P(A \cap B)$ .

606 On the coordinate plane below, sketch *at least one* cycle of a cosine function with a midline at  $y = -2$ , an amplitude of 3, and a period of  $\frac{\pi}{2}$ .



607 Algebraically prove that  $\frac{x^3 + 9}{x^3 + 8} = 1 + \frac{1}{x^3 + 8}$ , where  $x \neq -2$ .

608 Algebraically prove that the difference of the squares of any two consecutive integers is an odd integer.

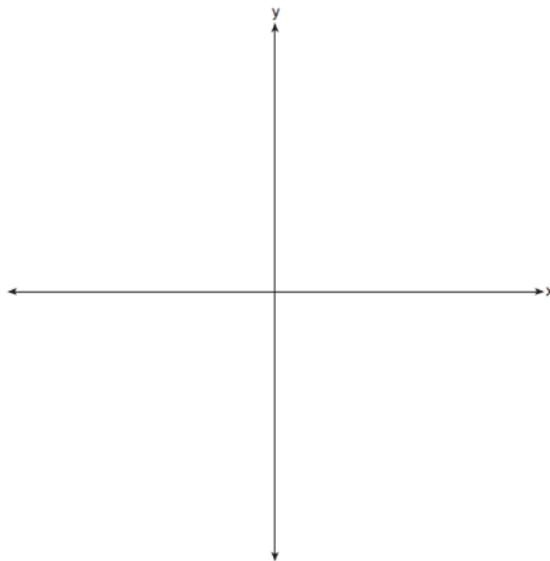
609 For  $n$  and  $p > 0$ , is the expression  $\left(p^2 n^{\frac{1}{2}}\right)^8 \sqrt{p^5 n^4}$  equivalent to  $p^{18} n^6 \sqrt{p}$ ? Justify your answer.

610 Write a recursive formula for the sequence 189, 63, 21, 7, ...

611 Factor the expression  $x^3 - 2x^2 - 9x + 18$  completely.

612 Solve algebraically for all values of  $x$ :  $\sqrt{x-4} + x = 6$

613 Sketch the graphs of  $r(x) = \frac{1}{x}$  and  $a(x) = |x| - 3$  on the set of axes below. Determine, to the *nearest tenth*, the positive solution of  $r(x) = a(x)$ .



614 An orange-juice processing plant receives a truckload of oranges. The quality control team randomly chooses three pails of oranges, each containing 50 oranges, from the truckload. Identify the sample and the population in the given scenario. State *one* conclusion that the quality control team could make about the population if 5% of the sample was found to be unsatisfactory.

615 Point  $M\left(t, \frac{4}{7}\right)$  is located in the second quadrant on the unit circle. Determine the exact value of  $t$ .

616 The table below shows the number of hours of daylight on the first day of each month in Rochester, NY.

| Month | Hours of Daylight |
|-------|-------------------|
| Jan.  | 9.4               |
| Feb.  | 10.6              |
| March | 11.9              |
| April | 13.9              |
| May   | 14.7              |
| June  | 15.4              |
| July  | 15.1              |
| Aug.  | 13.9              |
| Sept. | 12.5              |
| Oct.  | 11.1              |
| Nov.  | 9.7               |
| Dec.  | 9.0               |

Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st? Interpret what this means in the context of the problem.

617 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.



The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

618 Over the set of integers, factor the expression  $x^4 - 4x^2 - 12$ .

619 Given  $\tan \theta = \frac{7}{24}$ , and  $\theta$  terminates in Quadrant III, determine the value of  $\cos \theta$ .

620 Biologists are studying a new bacterium. They create a culture with 100 of the bacteria and anticipate that the number of bacteria will double every 30 hours. Write an equation for the number of bacteria,  $B$ , in terms of the number of hours,  $t$ , since the experiment began.

621 Natalia's teacher has given her the following information about angle  $\theta$ .

$$\bullet \pi < \theta < 2\pi$$

$$\bullet \cos \theta = \frac{\sqrt{3}}{4}$$

Explain how Natalia can determine if the value of  $\tan \theta$  is positive or negative.

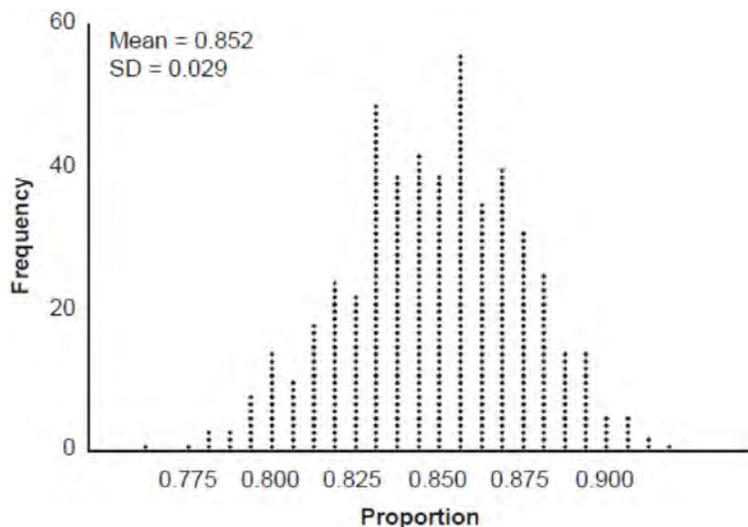
622 Given  $\cos A = \frac{3}{\sqrt{10}}$  and  $\cot A = -3$ , determine the value of  $\sin A$  in radical form.

623 When  $\left(\frac{1}{\sqrt[3]{y^2}}\right)^4$  is written in the form  $y^n$ , what is the value of  $n$ ? Justify your answer.

Algebra II 2 Point Regents Exam Questions

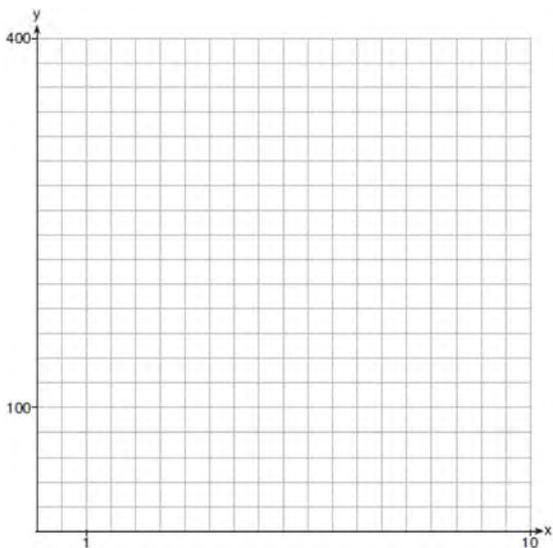
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- 624 An app design company believes that the proportion of high school students who have purchased apps on their smartphones in the past 3 months is 0.85. A simulation of 500 samples of 150 students was run based on this proportion and the results are shown below.



Suppose a sample of 150 students from your high school showed that 88% of students had purchased apps on their smartphones in the past 3 months. Based on the simulation, would the results from your high school give the app design company reason to believe their assumption is *incorrect*? Explain.

- 625 Graph  $y = 400(.85)^{2x} - 6$  on the set of axes below.



- 626 Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a + b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result algebraically.

- 627 The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.
- 628 Given  $r(x) = x^3 - 4x^2 + 4x - 6$ , find the value of  $r(2)$ . What does your answer tell you about  $x - 2$  as a factor of  $r(x)$ ? Explain.

Algebra II 2 Point Regents Exam Questions

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- 629 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

|         | Comedy Series | Drama Series | Reality Series | Total |
|---------|---------------|--------------|----------------|-------|
| Males   | 95            | 65           | 70             | 230   |
| Females | 80            | 70           | 110            | 260   |
| Total   | 175           | 135          | 180            | 490   |

Are the events “student is a male” and “student prefers reality series” independent of each other? Justify your answer.

- 630 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

| Upperclassmen Transportation Methods |       |              |      |
|--------------------------------------|-------|--------------|------|
|                                      | Drive | Take the Bus | Walk |
| Junior                               | 58    | 75           | 12   |
| Senior                               | 81    | 39           | 12   |

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

- 631 Consider the data in the table below.

|          |     |   |    |      |    |      |
|----------|-----|---|----|------|----|------|
| <b>x</b> | 1   | 2 | 3  | 4    | 5  | 6    |
| <b>y</b> | 3.9 | 6 | 11 | 18.1 | 28 | 40.3 |

State an exponential regression equation to model these data, rounding all values to the *nearest thousandth*.

- 632 The probability that a resident of a housing community opposes spending money for community improvement on plumbing issues is 0.8. The probability that a resident favors spending money on improving walkways given that the resident opposes spending money on plumbing issues is 0.85. Determine the probability that a randomly selected resident opposes spending money on plumbing issues and favors spending money on walkways.

- 633 The function  $d(t) = 2\cos\left(\frac{\pi}{6}t\right) + 5$  models the water depth, in feet, at a location in a bay,  $t$  hours since the last high tide. Determine the *minimum* water depth of the location, in feet, and justify your answer.

- 634 Over the set of integers, completely factor  $x^4 - 5x^2 + 4$ .

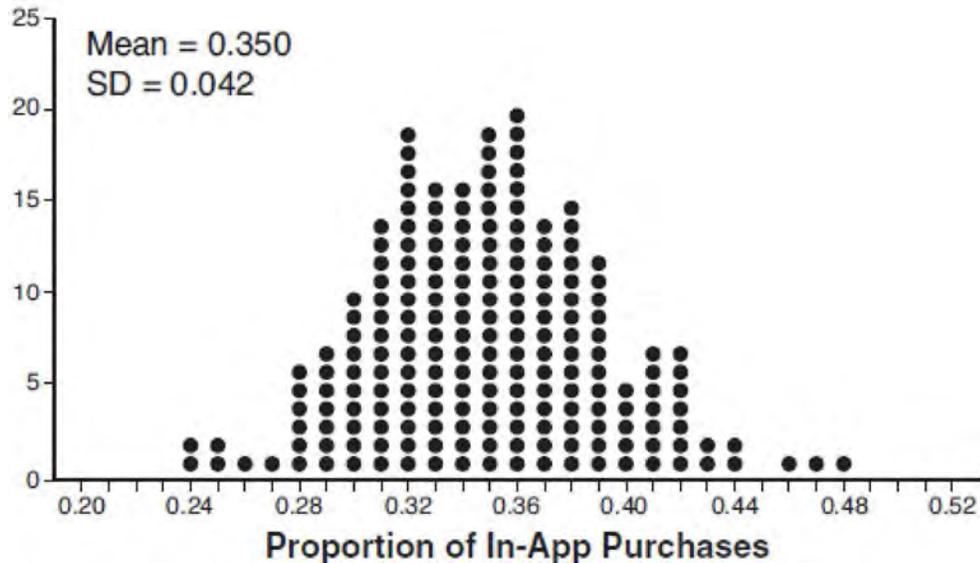
- 635 The monthly unemployment rate of towns in the United States is approximately normally distributed with a mean rate of 5.2% and a standard deviation of 1.6%. Determine the percentage of towns, to the *nearest integer*, that have a monthly unemployment rate greater than 6%.

- 636 Algebraically determine the values of  $x$  that satisfy the system of equations below.

$$y = -2x + 1$$

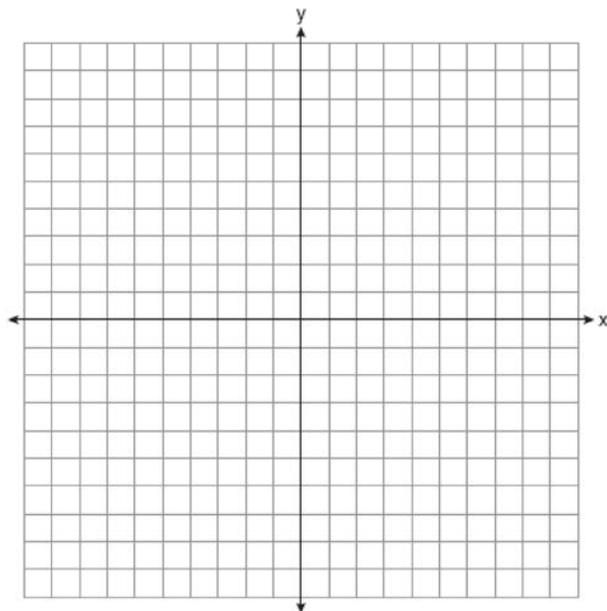
$$y = -2x^2 + 3x + 1$$

- 637 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.



Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.

- 638 Graph  $y = x^3 - 4x^2 + 2x + 7$  on the set of axes below.



- 639 Write  $(5 + 2yi)(4 - 3i) - (5 - 2yi)(4 - 3i)$  in  $a + bi$  form, where  $y$  is a real number.

- 640 Is  $x + 3$  a factor of  $7x^3 + 27x^2 + 9x - 27$ ? Justify your answer.

- 641 Given  $\cos \theta = -\frac{2}{7}$  with  $\theta$  in Quadrant II, find the exact value of  $\sin \theta$ .

- 642 Solve algebraically for  $n$ :  $\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$

- 643 Write the expression  $A(x) \cdot B(x) - 3C(x)$  as a polynomial in standard form.

$$A(x) = x^3 + 2x - 1$$

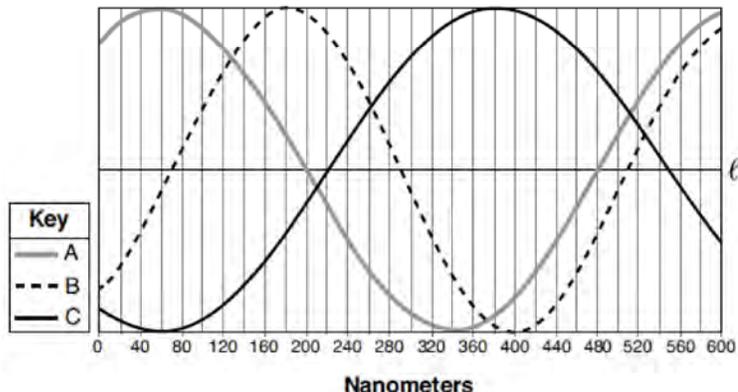
$$B(x) = x^2 + 7$$

$$C(x) = x^4 - 5x$$

Algebra II 2 Point Regents Exam Questions

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- 644 Visible light can be represented by sinusoidal waves. Three visible light waves are shown in the graph below. The midline of each wave is labeled  $\ell$ .



Based on the graph, which light wave has the longest period? Justify your answer.

- 645 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

|                   | <b>Wear Glasses</b> | <b>Don't Wear Glasses</b> |
|-------------------|---------------------|---------------------------|
| <b>Blue Eyes</b>  | 0.14                | 0.26                      |
| <b>Brown Eyes</b> | 0.11                | 0.24                      |
| <b>Green Eyes</b> | 0.10                | 0.15                      |

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

- 646 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

|                 | <b>Favorite Type of Program</b> |                     |                      |
|-----------------|---------------------------------|---------------------|----------------------|
|                 | <b>Sports</b>                   | <b>Reality Show</b> | <b>Comedy Series</b> |
| <b>Senior</b>   | 83                              | 110                 | 67                   |
| <b>Freshmen</b> | 119                             | 103                 | 54                   |

A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.

- 647 Explain how  $\left(3^{\frac{1}{5}}\right)^2$  can be written as the equivalent radical expression  $\sqrt[5]{9}$ .

- 648 Write  $\sqrt[3]{x} \cdot \sqrt{x}$  as a single term with a rational exponent.

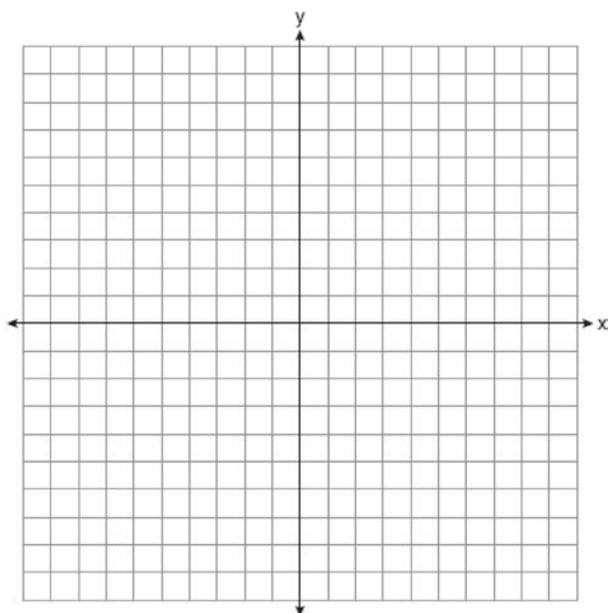
- 649 Given  $x$  is a real number, write the expression in simplest  $a + bi$  form:  $(x + 2i)(3 - 2xi) + 2x^2i$

650 The results of a poll of 200 students are shown in the table below:

|        | Preferred Music Style |     |         |
|--------|-----------------------|-----|---------|
|        | Techno                | Rap | Country |
| Female | 54                    | 25  | 27      |
| Male   | 36                    | 40  | 18      |

For this group of students, do these data suggest that gender and preferred music styles are independent of each other? Justify your answer.

651 Graph *at least one* cycle of  $y = 5 \sin(4x) - 3$  on the set of axes below.



652 Determine the quotient and remainder when  $(6a^3 + 11a^2 - 4a - 9)$  is divided by  $(3a - 2)$ .

Express your answer in the form  $q(a) + \frac{r(a)}{d(a)}$ .

653 An angle,  $\theta$ , is in standard position and its terminal side passes through the point  $(2, -1)$ . Find the *exact* value of  $\sin \theta$ .

654 Solve algebraically for all values of  $x$ :

$$\sqrt{4x+1} = 11-x$$

655 The heights of the members of a ski club are normally distributed. The average height is 64.7 inches with a standard deviation of 4.3 inches. Determine the percentage of club members, to the *nearest percent*, who are between 67 inches and 72 inches tall.

656 Consider the parabola given by  $y = \frac{1}{4}x^2 + x + 8$  with vertex  $(-2, 7)$  and focus  $(-2, 8)$ . Use this information to explain how to determine the equation of the directrix.

657 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again. A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

658 Express  $(1-i)^3$  in  $a+bi$  form.

659 In New York State, the minimum wage has grown exponentially. In 1966, the minimum wage was \$1.25 an hour and in 2015, it was \$8.75. Algebraically determine the rate of growth to the *nearest percent*.

Algebra II 2 Point Regents Exam Questions

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660 The  $x$ -value of which function's  $x$ -intercept is larger,  $f$  or  $h$ ? Justify your answer.

$$f(x) = \log(x - 4)$$

| $x$ | $h(x)$ |
|-----|--------|
| -1  | 6      |
| 0   | 4      |
| 1   | 2      |
| 2   | 0      |
| 3   | -2     |

661 Markus is a long-distance walker. In one race, he walked 55 miles in  $t$  hours and in another race walked 65 miles in  $t + 3$  hours. His rates are shown in the equations below.

$$r = \frac{55}{t} \quad r = \frac{65}{t+3}$$

Markus walked at an equivalent rate,  $r$ , for each race. Determine the number of hours that each of the two races took.

662 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the-students of the first period computer science class. Explain a statistical bias in the method of data collection.

663 When the function  $p(x)$  is divided by  $x - 1$  the quotient is  $x^2 + 7 + \frac{5}{x-1}$ . State  $p(x)$  in standard form.

664 Describe the transformation applied to the graph of  $p(x) = 2^x$  that forms the new function  $q(x) = 2^{x-3} + 4$ .

665 The recursive formula to describe a sequence is shown below.

$$a_1 = 3$$

$$a_n = 1 + 2a_{n-1}$$

State the first four terms of this sequence. Can this sequence be represented using an explicit geometric formula? Justify your answer.

666 The initial push of a child on a swing causes the swing to travel a total of 6 feet. Each successive swing travels 80% of the distance of the previous swing. Determine the total distance, to the *nearest hundredth of a foot*, a child travels in the first five swings.

667 A survey was given to 1250 randomly selected high school students at the end of their junior year. The survey offered four post-graduation options: two-year college, four-year college, military, or work. Of the 1250 responses, 475 chose a four-year college. State *one* possible conclusion that can be made about the population of high school juniors, based on this survey.

668 The scores on a collegiate mathematics readiness assessment are approximately normally distributed with a mean of 680 and a standard deviation of 120. Determine the percentage of scores between 690 and 900, to the *nearest percent*.

669 A suburban high school has a population of 1376 students. The number of students who participate in sports is 649. The number of students who participate in music is 433. If the probability that a student participates in either sports or music is  $\frac{974}{1376}$ , what is the probability that a student participates in both sports and music?

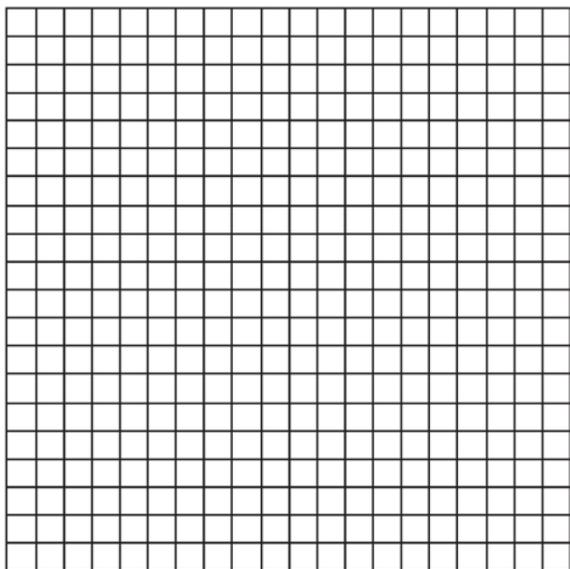
670 Over the set of integers, factor the expression  $2x^4 - 10x^3 + 3x^2 - 15x$  completely.

Algebra II 2 Point Regents Exam Questions

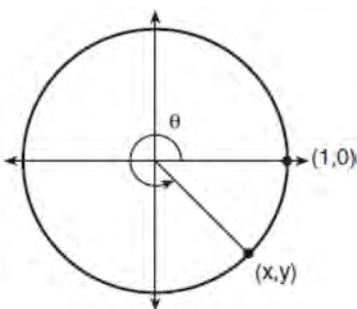
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671 Express the fraction  $\frac{2x^{\frac{3}{2}}}{(16x^4)^{\frac{1}{4}}}$  in simplest radical form.

672 The zeros of a quartic polynomial function  $h$  are  $-1, \pm 2,$  and  $3$ . Sketch a graph of  $y = h(x)$  on the grid below.



673 Using the unit circle below, explain why  $\csc \theta = \frac{1}{y}$ .



674 The population of bacteria,  $P(t)$ , in hundreds, after  $t$  hours can be modeled by the function  $P(t) = 37e^{0.0532t}$ . Determine whether the population is increasing or decreasing over time. Explain your reasoning.

675 Show why  $x - 3$  is a factor of  $m(x) = x^3 - x^2 - 5x - 3$ . Justify your answer.

676 A house purchased 5 years ago for \$100,000 was just sold for \$135,000. Assuming exponential growth, approximate the annual growth rate, to the nearest percent.

677 A formula for work problems involving two people is shown below.

$$\frac{1}{t_1} + \frac{1}{t_2} = \frac{1}{t_b}$$

$t_1$  = the time taken by the first person to complete the job

$t_2$  = the time taken by the second person to complete the job

$t_b$  = the time it takes for them working together to complete the job

Fred and Barney are carpenters who build the same model desk. It takes Fred eight hours to build the desk while it only takes Barney six hours. Write an equation that can be used to find the time it would take both carpenters working together to build a desk. Determine, to the nearest tenth of an hour, how long it would take Fred and Barney working together to build a desk.

678 Write a recursive formula for the sequence 6, 9, 13.5, 20.25, ...

679 The average monthly high temperature in Buffalo, in degrees Fahrenheit, can be modeled by the function  $B(t) = 25.29 \sin(0.4895t - 1.9752) + 55.2877$ , where  $t$  is the month number (January = 1). State, to the nearest tenth, the average monthly rate of temperature change between August and November. Explain its meaning in the given context.

680 Use an appropriate procedure to show that  $x - 4$  is a factor of the function  $f(x) = 2x^3 - 5x^2 - 11x - 4$ . Explain your answer.

Algebra II 2 Point Regents Exam Questions

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681 Consider the function  $h(x) = 2\sin(3x) + 1$  and the function  $q$  represented in the table below.

| $x$ | $q(x)$ |
|-----|--------|
| -2  | -8     |
| -1  | 0      |
| 0   | 0      |
| 1   | -2     |
| 2   | 0      |

Determine which function has the *smaller* minimum value for the domain  $[-2, 2]$ . Justify your answer.

682 Given  $a > 1$ , use the properties of rational exponents to determine the value of  $x$  for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = a^x$$

683 Does the equation  $x^2 - 4x + 13 = 0$  have imaginary solutions? Justify your answer.

684 Express  $(2xi^3 - 3y)^2$  in simplest form.

685 A person's lung capacity can be modeled by the function  $C(t) = 250\sin\left(\frac{2\pi}{5}t\right) + 2450$ , where  $C(t)$

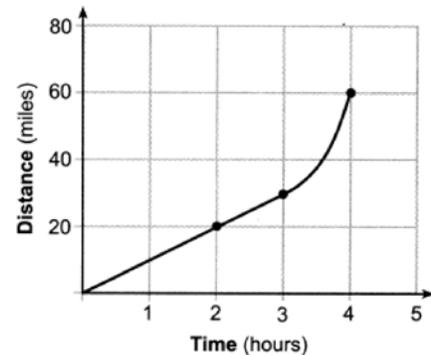
represents the volume in mL present in the lungs after  $t$  seconds. State the maximum value of this function over one full cycle, and explain what this value represents.

686 A study was designed to test the effectiveness of a new drug. Half of the volunteers received the drug. The other half received a sugar pill. The probability of a volunteer receiving the drug and getting well was 40%. What is the probability of a volunteer getting well, given that the volunteer received the drug?

687 Solve  $3.8e^{1.5t} = 16$  algebraically for  $t$  to the *nearest hundredth*.

688 Given that  $\left(\frac{y^{\frac{17}{8}}}{y^{\frac{5}{4}}}\right)^{-4} = y^n$ , where  $y > 0$ , determine the value of  $n$ .

689 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



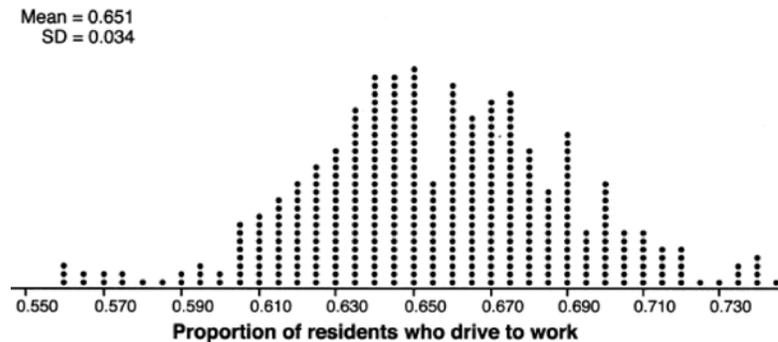
690 The business office of a local college wishes to determine the methods of payment that will be used by students when buying books at the beginning of a semester. Explain how the office can gather an appropriate sample that minimizes bias.

691 Solve the equation  $3x^2 + 5x + 8 = 0$ . Write your solution in  $a + bi$  form.

692 Solve algebraically for  $x$ :  $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

**Algebra II 4 Point Regents Exam Questions**

- 693 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



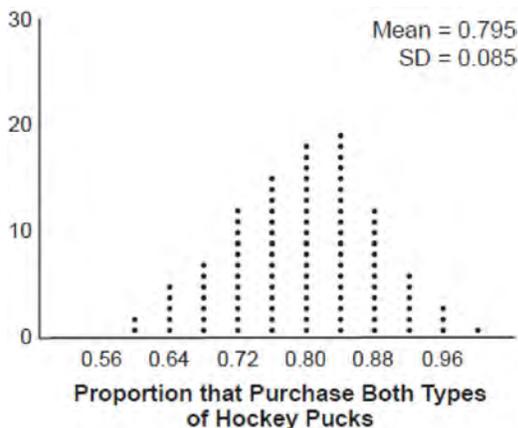
Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*. One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

- 694 Two versions of a standardized test are given, an April version and a May version. The statistics for the April version show a mean score of 480 and a standard deviation of 24. The statistics for the May version show a mean score of 510 and a standard deviation of 20. Assume the scores are normally distributed. Joanne took the April version and scored in the interval 510-540. What is the probability, to the *nearest ten thousandth*, that a test paper selected at random from the April version scored in the same interval? Maria took the May version. In what interval must Maria score to claim she scored as well as Joanne?
- 695 Solve the following system of equations algebraically for all values of  $x$ ,  $y$ , and  $z$ :
- $$\begin{aligned}x + 3y + 5z &= 45 \\6x - 3y + 2z &= -10 \\-2x + 3y + 8z &= 72\end{aligned}$$
- 696 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of \$21,000 and a \$1000 down payment, to the *nearest cent*.
- $$P_n = PMT \left( \frac{1 - (1 + i)^{-n}}{i} \right)$$
- $P_n$  = present amount borrowed  
 $n$  = number of monthly pay periods  
 $PMT$  = monthly payment  
 $i$  = interest rate per month
- The affordable monthly payment is \$300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.
- 697 Solve the following system of equations algebraically for all values of  $x$ ,  $y$ , and  $z$ :
- $$\begin{aligned}2x + 3y - 4z &= -1 \\x - 2y + 5z &= 3 \\-4x + y + z &= 16\end{aligned}$$

Algebra II 4 Point Regents Exam Questions

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- 698 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



- a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.
- b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part a, explain whether or not the company should continue to produce both types of hockey pucks.

- 699 Solve the system of equations shown below algebraically.

$$(x - 3)^2 + (y + 2)^2 = 16$$

$$2x + 2y = 10$$

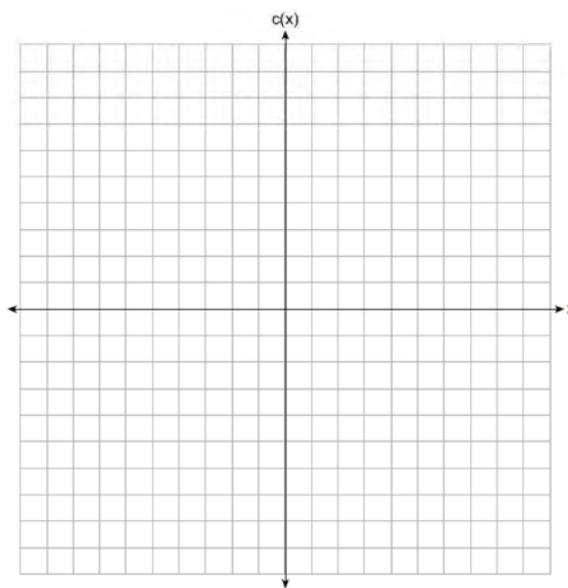
- 700 Evaluate  $j(-1)$  given

$j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$ . Explain what your answer tells you about  $x + 1$  as a factor. Algebraically find the remaining zeros of  $j(x)$ .

- 701 Given  $f(x) = 3x^3 - 4x^2 + 2x - 1$  and  $g(x) = x - 4$ , state the quotient and remainder of  $\frac{f(x)}{g(x)}$ , in the form  $q(x) + \frac{r(x)}{g(x)}$ . Is  $x = 4$  a root of  $f(x)$ ? Explain your answer.

- 702 Solve the given equation algebraically for all values of  $x$ .  $3\sqrt{x} - 2x = -5$

- 703 Graph  $c(x) = -9(3)^{x-4} + 2$  on the axes below.



Describe the end behavior of  $c(x)$  as  $x$  approaches positive infinity. Describe the end behavior of  $c(x)$  as  $x$  approaches negative infinity.

- 704 Solve the following system of equations algebraically for  $x$ ,  $y$ , and  $z$ .

$$2x + 4y - 3z = 12$$

$$3x - 2y + 2z = -9$$

$$-x + y - 3z = 0$$

- 705 Solve the equation  $\sqrt{49 - 10x} + 5 = 2x$  algebraically.

Algebra II 4 Point Regents Exam Questions

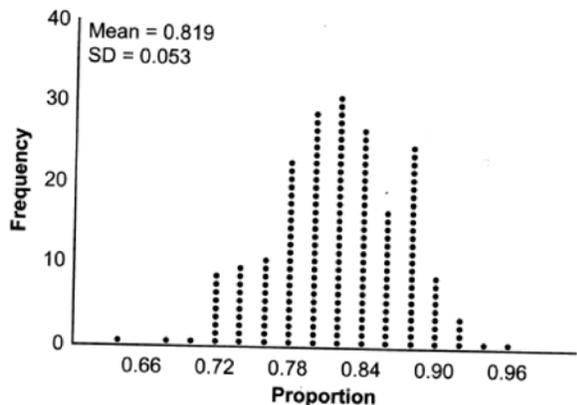
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- 706 A researcher wants to determine if nut allergies and milk allergies are related to each other. The researcher surveyed 1500 people and asked them if they are allergic to nuts or milk. The survey results are summarized in the table below.

|                      | Allergic to Nuts | Not Allergic to Nuts |
|----------------------|------------------|----------------------|
| Allergic to Milk     | 3                | 42                   |
| Not Allergic to Milk | 12               | 1443                 |

Determine the probability that a randomly selected survey respondent is allergic to milk. Determine the probability that a randomly selected survey respondent is allergic to milk, given that the person is allergic to nuts. Based on the survey data, determine whether nut allergies and milk allergies are independent events. Justify your answer.

- 707 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*. The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

- 708 Solve the following system of equations algebraically for all values of  $a$ ,  $b$ , and  $c$ .

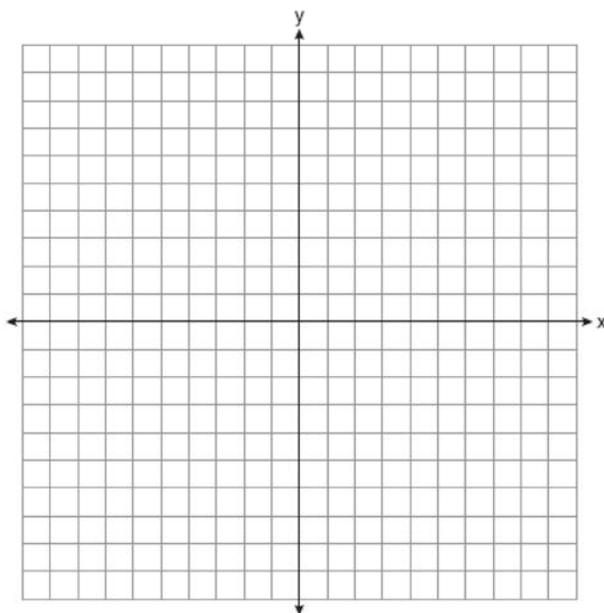
$$a + 4b + 6c = 23$$

$$a + 2b + c = 2$$

$$6b + 2c = a + 14$$

- 709 Graph the following function on the axes below.

$$f(x) = \log_3(2 - x)$$

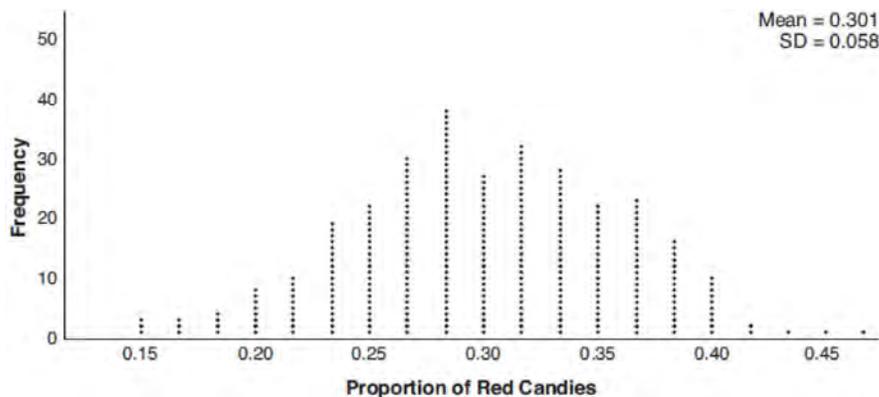


State the domain of  $f$ . State the equation of the asymptote.

Algebra II 4 Point Regents Exam Questions

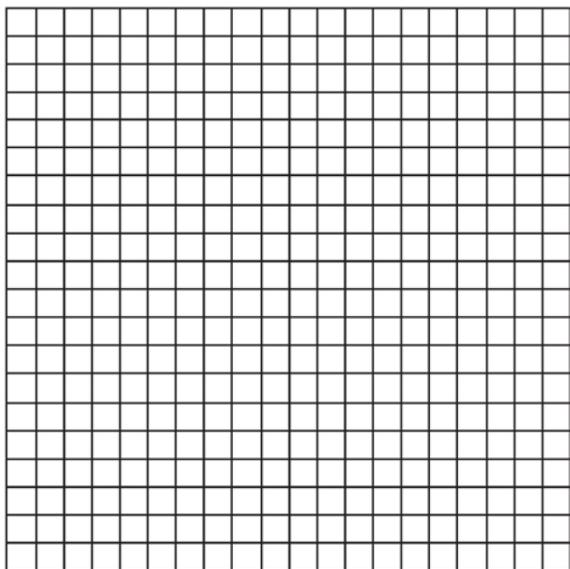
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- 710 Mary bought a pack of candy. The manufacturer claims that 30% of the candies manufactured are red. In her pack, 14 of the 60 candies are red. She ran a simulation of 300 samples, assuming the manufacturer is correct. The results are shown below.

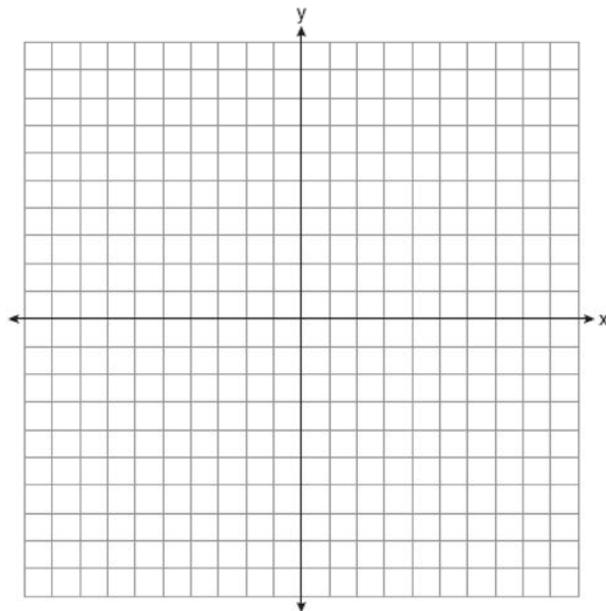


Based on the simulation, determine the middle 95% of plausible values that the proportion of red candies in a pack is within. Based on the simulation, is it unusual that Mary’s pack had 14 red candies out of a total of 60? Explain.

- 711 Write an equation for a sine function with an amplitude of 2 and a period of  $\frac{\pi}{2}$ . On the grid below, sketch the graph of the equation in the interval 0 to  $2\pi$ .



- 712 Graph  $y = \log_2(x + 3) - 5$  on the set of axes below. Use an appropriate scale to include *both* intercepts.

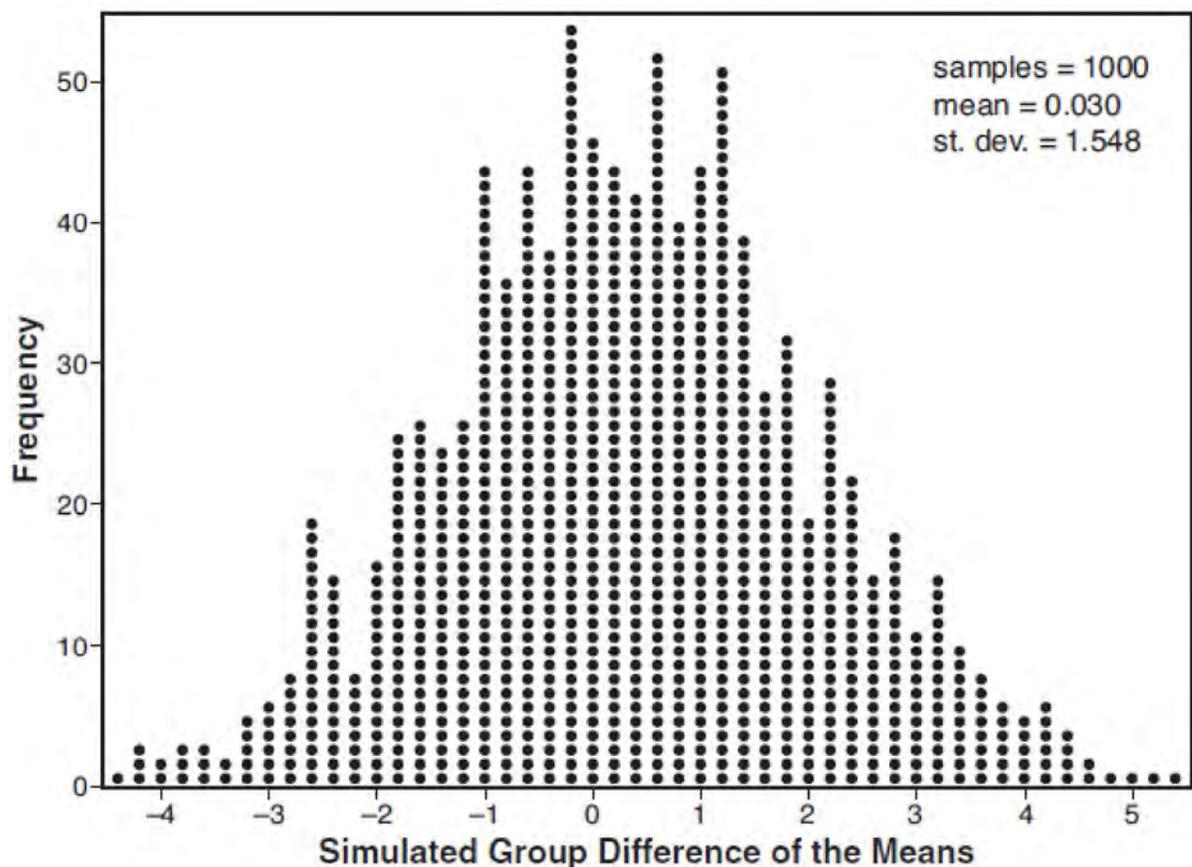


Describe the behavior of the given function as  $x$  approaches  $-3$  and as  $x$  approaches positive infinity.

- 713 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

|           | Scented Paper | Unscented Paper |
|-----------|---------------|-----------------|
| $\bar{x}$ | 23            | 18              |
| $s_x$     | 2.898         | 2.408           |

Calculate the difference in means in the experimental test grades (scented -unscented). A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.

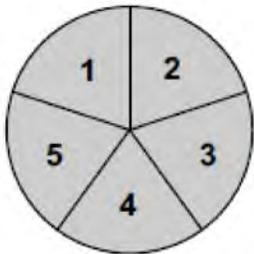


Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the nearest hundredth. Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

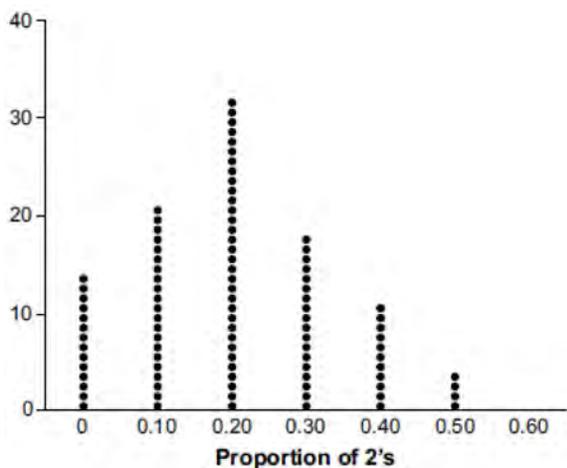
- 714 Solve the equation  $\sqrt{2x-7} + x = 5$  algebraically, and justify the solution set.

715 Solve for all values of  $p$ :  $\frac{3p}{p-5} - \frac{2}{p+3} = \frac{p}{p+3}$

- 716 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.



She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game. State the proportion of 2's that were spun. State the theoretical probability of spinning a 2. The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.



Does the output indicate that the carnival game was unfair? Explain your answer.

- 717 Solve the following system of equations algebraically for all values of  $x$ ,  $y$ , and  $z$ :

$$\begin{aligned} x + y + z &= 1 \\ 2x + 4y + 6z &= 2 \\ -x + 3y - 5z &= 11 \end{aligned}$$

- 718 Solve algebraically for all values of  $x$ :

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

- 719 A population of 950 bacteria grows continuously at a rate of 4.75% per day. Write an exponential function,  $N(t)$ , that represents the bacterial population after  $t$  days and explain the reason for your choice of base. Determine the bacterial population after 36 hours, to the nearest bacterium.

- 720 The monthly high temperature ( $^{\circ}\text{F}$ ) in Buffalo, New York can be modeled by

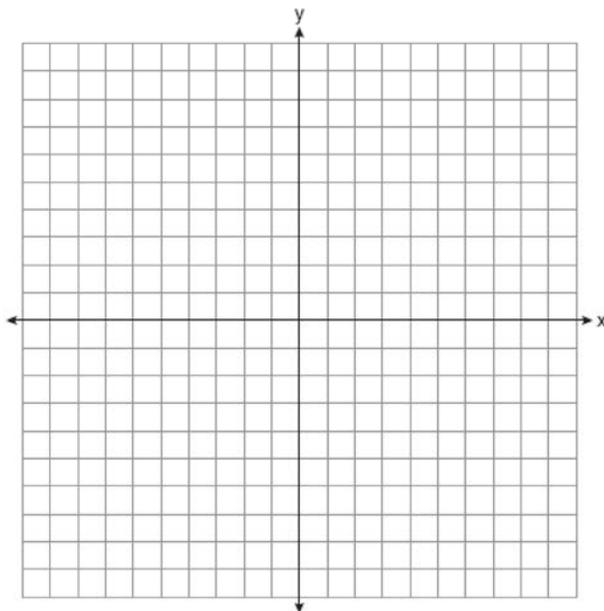
$$B(m) = 24.9 \sin(0.5m - 2.05) + 55.25$$

where  $m$  is the number of the month and January = 1. Find the average rate of change in the monthly high temperature between June and October, to the nearest hundredth. Explain what this value represents in the given context.

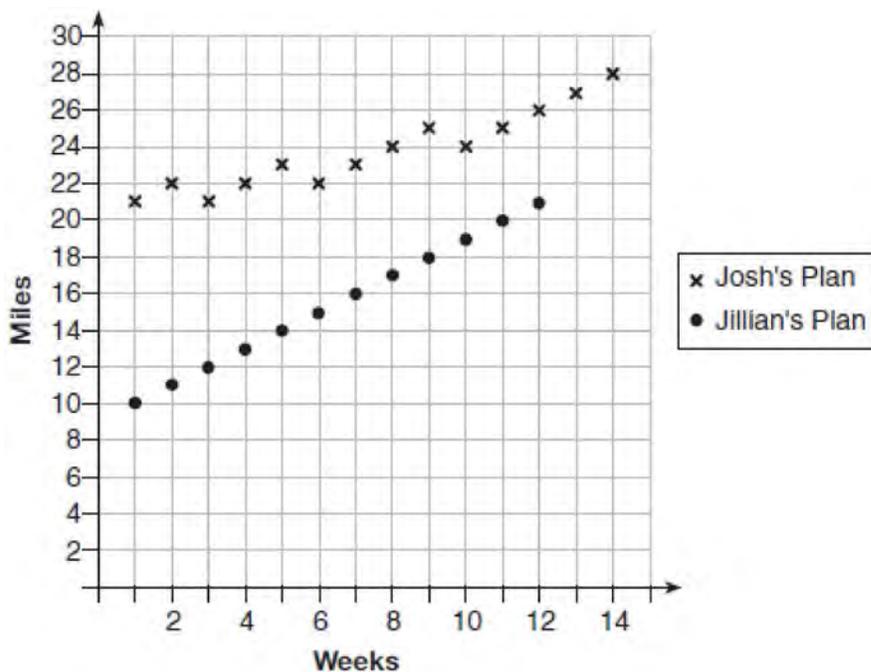
- 721 Find algebraically the zeros for

$$p(x) = x^3 + x^2 - 4x - 4$$

On the set of axes below, graph  $y = p(x)$ .

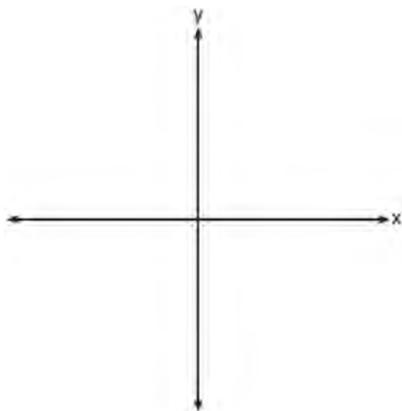


- 722 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer. Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose. Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

- 723 Patricia creates a cubic polynomial function,  $p(x)$ , with a leading coefficient of 1. The zeros of the function are 2, 3, and  $-6$ . Write an equation for  $p(x)$ . Sketch  $y = p(x)$  on the set of axes below.



- 724 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment,  $M$ , is

$$M = P \cdot \frac{r(1+r)^N}{(1+r)^N - 1}$$

where  $P$  is the principal

amount of the loan,  $r$  is the monthly interest rate, and  $N$  is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage. With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*. Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

725 Which function shown below has a greater average rate of change on the interval  $[-2,4]$ ? Justify your answer.

| $x$ | $f(x)$ |
|-----|--------|
| -4  | 0.3125 |
| -3  | 0.625  |
| -2  | 1.25   |
| -1  | 2.5    |
| 0   | 5      |
| 1   | 10     |
| 2   | 20     |
| 3   | 40     |
| 4   | 80     |
| 5   | 160    |
| 6   | 320    |

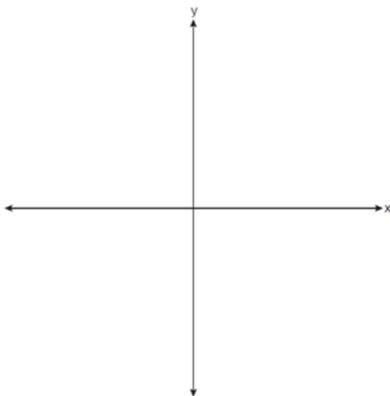
$$g(x) = 4x^3 - 5x^2 + 3$$

726 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

|                     | Juan Wins | Felipe Wins |
|---------------------|-----------|-------------|
| Short Practice Time | 8         | 10          |
| Long Practice Time  | 15        | 12          |

Given that the practice time was long, determine the exact probability that Filipe wins the next match. Determine whether or not the two events “Filipe wins” and “long practice time” are independent. Justify your answer.

727 Sketch  $p(x) = -\log_2(x + 3) + 2$  on the axes below.



Describe the end behavior of  $p(x)$  as  $x \rightarrow -3$ .

Describe the end behavior of  $p(x)$  as  $x \rightarrow \infty$ .

728 During the summer, Adam saved \$4000 and Betty saved \$3500. Adam deposited his money in Bank A at an annual rate of 2.4% compounded monthly. Betty deposited her money in Bank B at an annual rate of 4% compounded quarterly. Write two functions that represent the value of each account after  $t$  years if no other deposits or withdrawals are made, where Adam's account value is represented by  $A(t)$ , and Betty's by  $B(t)$ . Using technology, determine, to the *nearest tenth of a year*, how long it will take for the two accounts to have the same amount of money in them. Justify your answer.

729 Factor completely over the set of integers:

$16x^4 - 81$ . Sara graphed the polynomial  $y = 16x^4 - 81$  and stated “All the roots of  $y = 16x^4 - 81$  are real.” Is Sara correct? Explain your reasoning.

Algebra II 4 Point Regents Exam Questions

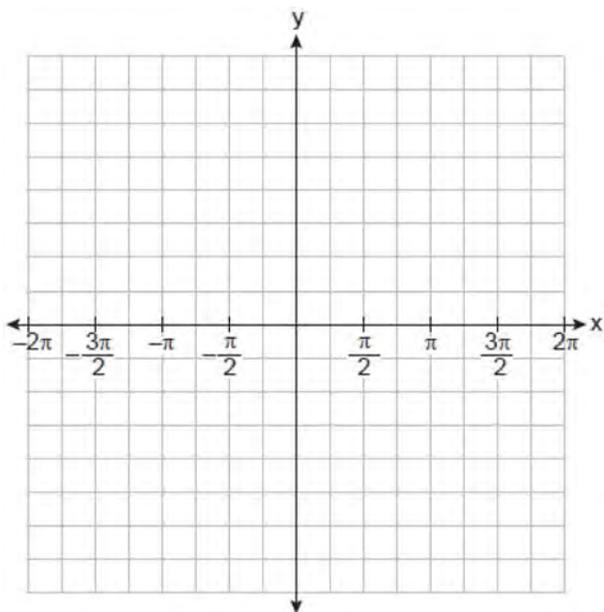
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- 730 The population of China, in millions, can be modeled by the function  $P(x) = 316.93e^{0.0133x}$ , where  $x$  is the number of years since 1900. The population of India since 1900 is summarized in the table below:

| Years since 1900 | Population (millions) |
|------------------|-----------------------|
| 0                | 243                   |
| 10               | 254                   |
| 20               | 268                   |
| 30               | 285                   |
| 40               | 324                   |
| 50               | 376.3                 |
| 60               | 450.6                 |
| 70               | 555.1                 |
| 80               | 699                   |
| 60               | 873.3                 |
| 100              | 1056.6                |
| 110              | 1234.3                |
| 120              | 1380                  |

Which country's population had a greater average rate of change between 1950 and 2020? Justify your answer.

- 731 On the graph below, draw at least one complete cycle of a sine graph passing through point  $(0, 2)$  that has an amplitude of 3, a period of  $\pi$ , and a midline at  $y = 2$ .



Based on your graph, state an interval in which the graph is increasing.

- 732 Given  $a(x) = x^4 + 2x^3 + 4x - 10$  and  $b(x) = x + 2$ , determine  $\frac{a(x)}{b(x)}$  in the form  $q(x) + \frac{r(x)}{b(x)}$ . Is  $b(x)$  a factor of  $a(x)$ ? Explain.

- 733 Solve for  $x$  algebraically:  

$$\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2 - 8x + 12}$$

- 734 One of the medical uses of Iodine-131 (I-131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I-131 is approximately 8.02 days. A patient is injected with 20 milligrams of I-131. Determine, to the nearest day, the amount of time needed before the amount of I-131 in the patient's body is approximately 7 milligrams.

- 735 Consider the function  $f(x) = 2^x$ . Is  $f(x)$  an even function? Justify your answer. Write an equation for  $g(x)$ , the function that results after  $f(x)$  is shifted up 5 units. Write an equation for  $h(x)$ , the inverse of  $g(x)$ .

Algebra II 4 Point Regents Exam Questions

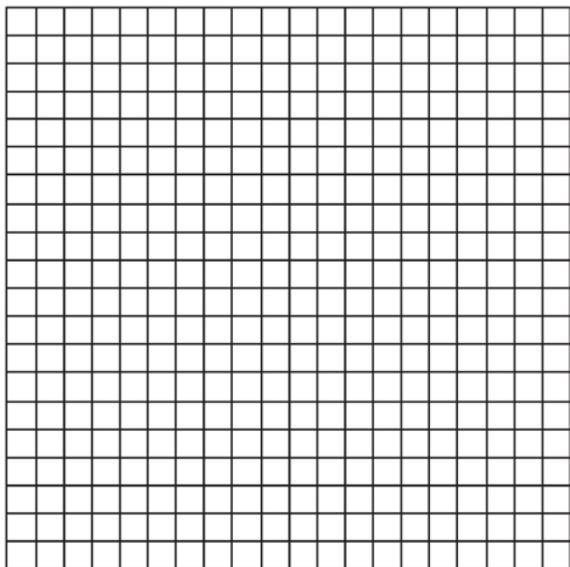
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- 736 A public radio station held a fund-raiser. The table below summarizes the donor category and method of donation.

|                    |             | Donor Category |        |
|--------------------|-------------|----------------|--------|
|                    |             | Supporter      | Patron |
| Method of Donation | Phone calls | 400            | 672    |
|                    | Online      | 1200           | 2016   |

To the *nearest thousandth*, find the probability that a randomly selected donor was categorized as a supporter, given that the donation was made online. Do these data indicate that being a supporter is independent of donating online? Justify your answer.

- 737 The half-life of a radioactive substance is 15 years. Write an equation that can be used to determine the amount,  $s(t)$ , of 200 grams of this substance that remains after  $t$  years. Determine algebraically, to the *nearest year*, how long it will take for  $\frac{1}{10}$  of this substance to remain.
- 738 Determine an equation for the parabola with focus  $(-2,4)$  and directrix  $y = 10$ . (The use of the grid below is optional.)



- 739 A student is chosen at random from the student body at a given high school. The probability that the student selects Math as the favorite subject is  $\frac{1}{4}$ . The probability that the student chosen is a junior is  $\frac{116}{459}$ . If the probability that the student selected is a junior or that the student chooses Math as the favorite subject is  $\frac{47}{108}$ , what is the exact probability that the student selected is a junior whose favorite subject is Math? Are the events "the student is a junior" and "the student's favorite subject is Math" independent of each other? Explain your answer.
- 740 Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book. Suppose the total amount Simon owes when the book is  $n$  days late can be determined by an arithmetic sequence. Determine a formula for  $a_n$ , the  $n$ th term of this sequence. Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

- 741 Solve the following system of equations algebraically for all values of  $x$ ,  $y$ , and  $z$ :
- $$3x - 8y + 2z = -60$$
- $$2x - 7y - 5z = -31$$
- $$-6x + 2y - 4z = 36$$

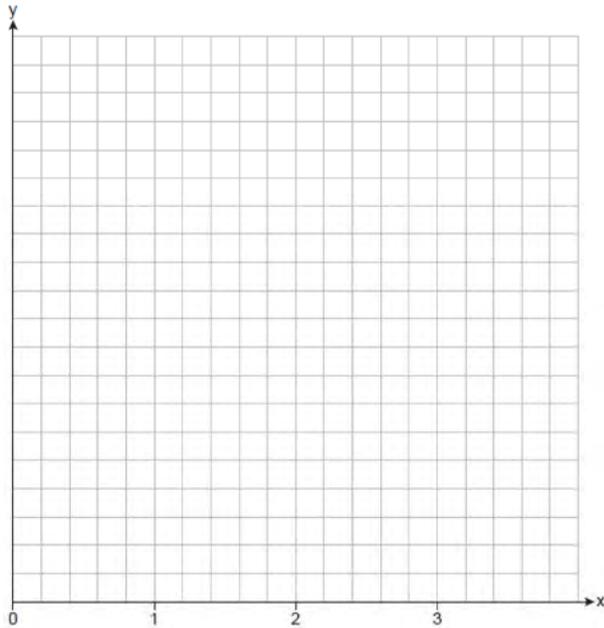
- 742 Determine, to the *nearest tenth of a year*, how long it would take an investment to double at a  $3\frac{3}{4}\%$  interest rate, compounded continuously.

- 743 Algebraically solve the system:
- $$(x - 2)^2 + (y - 3)^2 = 20$$
- $$y = -2x + 7$$

Algebra II 4 Point Regents Exam Questions

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- 744 The function  $v(x) = x(3-x)(x+4)$  models the volume, in cubic inches, of a rectangular solid for  $0 \leq x \leq 3$ . Graph  $y = v(x)$  over the domain  $0 \leq x \leq 3$ .



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

- 745 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function  $H(t) = 200,000(1.045)^t$ , where  $t$  is the number of years since 2008 and  $H(t)$  is the median house price. Determine the average rate of change for the median house price in Skaneateles, from 2010 to 2018 to the *nearest dollar per year*. Explain what this rate of change means as it relates to median house prices.
- 746 Alexa earns \$33,000 in her first year of teaching and earns a 4% increase in each successive year. Write a geometric series formula,  $S_n$ , for Alexa's total earnings over  $n$  years. Use this formula to find Alexa's total earnings for her first 15 years of teaching, to the *nearest cent*.

- 747 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let  $A$  be the event that the guest room has a view of the lake, and let  $B$  be the event that the guest room has a queen-size bed. Events  $A$  and  $B$  are found to be independent of each other. Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed. Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

748 Algebraically solve for  $x$ :  $2x = 6 + 2\sqrt{x-1}$

- 749 a) Algebraically determine the roots, in simplest  $a + bi$  form, to the equation below.

$$x^2 - 2x + 7 = 4x - 10$$

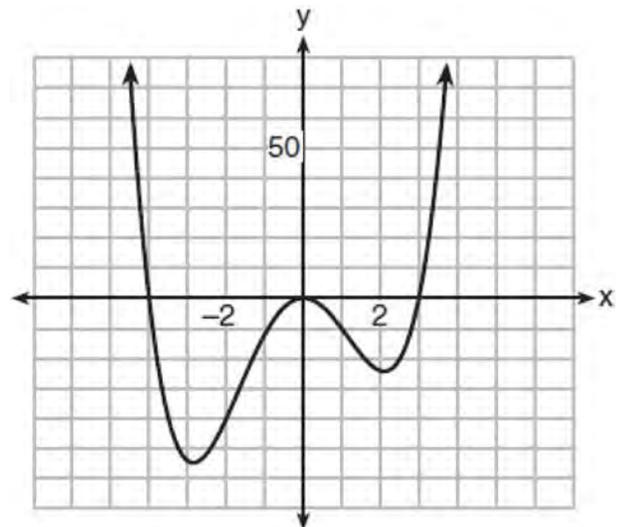
- b) Consider the system of equations below.

$$y = x^2 - 2x + 7$$

$$y = 4x - 10$$

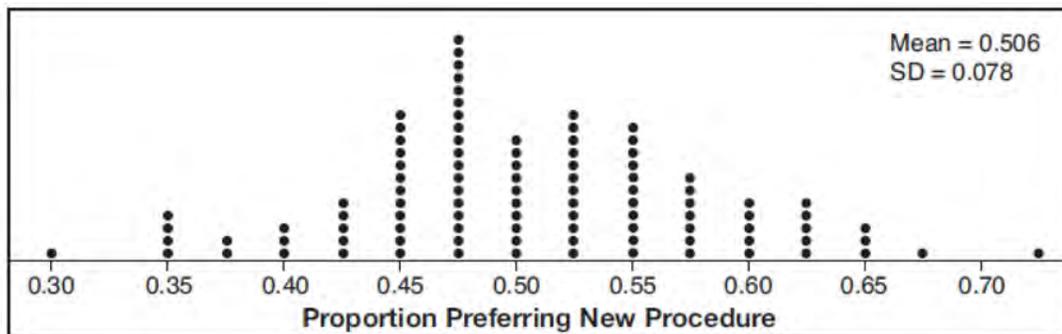
The graph of this system confirms the solution from part *a* is imaginary. Explain why.

- 750 The graph of  $y = f(x)$  is shown below. The function has a leading coefficient of 1.



Write an equation for  $f(x)$ . The function  $g$  is formed by translating function  $f$  left 2 units. Write an equation for  $g(x)$ .

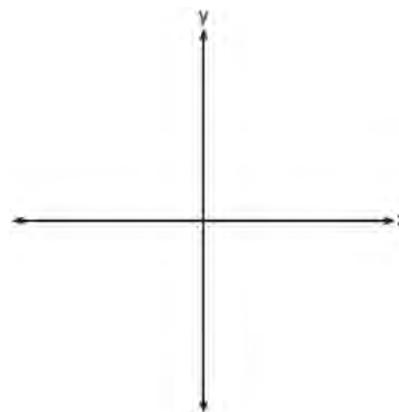
- 751 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*. Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

- 752 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.
- Assuming an initial value of 11,000 bacteria, write a function,  $p(t)$ , that can be used to model the population of bacteria,  $p$ , on a smartphone screen, where  $t$  represents the time in minutes after it is first observed under a microscope.
  - Using  $p(t)$  from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

- 754 Algebraically find the zero of  $c(x) = x^3 + 2x^2 - 16x - 32$ . On the axes below, sketch  $y = c(x)$ .



- 753 Algebraically solve the following system of equations.

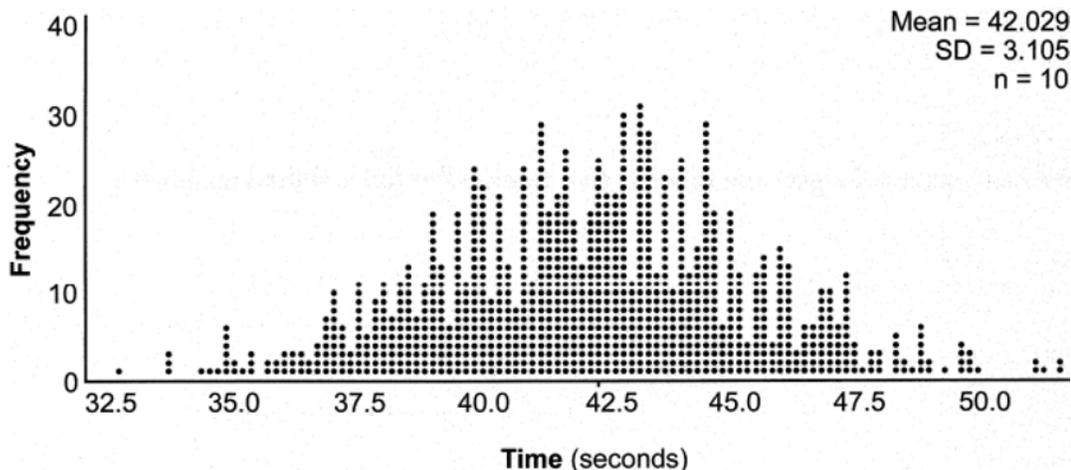
$$\begin{aligned} (x - 2)^2 + (y - 3)^2 &= 16 \\ x + y - 1 &= 0 \end{aligned}$$

- 755 Solve the system of equations algebraically.
- $$\begin{aligned} x^2 + y^2 &= 25 \\ y + 5 &= 2x \end{aligned}$$

Algebra II 4 Point Regents Exam Questions

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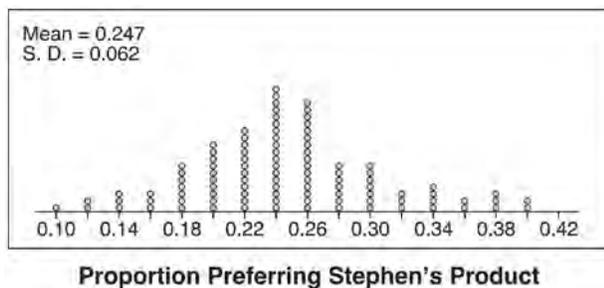
- 756 In a packaging plant, a machine packs boxes with jars. The machine's manufacturer states that a box is packed, on average, every 42 seconds. To test that claim, the packaging plant randomly selects a sample of 10 boxes and finds the sample mean to be 49.8 seconds. The company ran a simulation of 1000 trials based on the manufacturer's claim. The approximately normal results are shown below.



Based on the simulation, determine an interval containing the middle 95% of plausible mean times. Round your answer to the *nearest hundredth*. Is the time 49.8 seconds unusual? Use statistical evidence to justify your answer.

- 757 In contract negotiations between a local government agency and its workers, it is estimated that there is a 50% chance that an agreement will be reached on the salaries of the workers. It is estimated that there is a 70% chance that there will be an agreement on the insurance benefits. There is a 20% chance that no agreement will be reached on either issue. Find the probability that an agreement will be reached on *both* issues. Based on this answer, determine whether the agreement on salaries and the agreement on insurance are independent events. Justify your answer.
- 758 Write an explicit formula for  $a_n$ , the  $n$ th term of the recursively defined sequence below.
- $$a_1 = x + 1$$
- $$a_n = x(a_{n-1})$$
- For what values of  $x$  would  $a_n = 0$  when  $n > 1$ ?
- 759 Algebraically determine the values of  $h$  and  $k$  to correctly complete the identity stated below.
- $$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$
- 760 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time,  $t$ , in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation  $t = 2\pi\sqrt{\frac{L}{g}}$  where  $L$  is the length of the pendulum in meters and  $g$  is a constant of  $9.81 \text{ m/s}^2$ . The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing. Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.
- 761 Given:  $f(x) = 2x^2 + x - 3$  and  $g(x) = x - 1$   
Express  $f(x) \cdot g(x) - [f(x) + g(x)]$  as a polynomial in standard form.

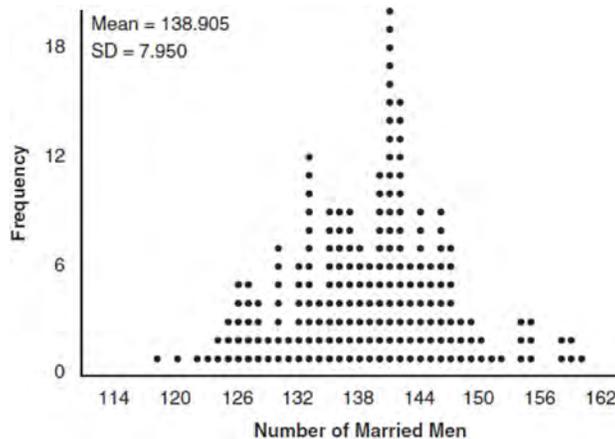
- 762 Stephen's Beverage Company is considering whether to produce a new brand of cola. The company will launch the product if at least 25% of cola drinkers will buy the product. Fifty cola drinkers are randomly selected to take a blind taste-test of products *A*, *B*, and the new product. Nine out of fifty participants preferred Stephen's new cola to products *A* and *B*. The company then devised a simulation based on the requirement that 25% of cola drinkers will buy the product. Each dot in the graph shown below represents the proportion of people who preferred Stephen's new product, each of sample size 50, simulated 100 times.



Assume the set of data is approximately normal and the company wants to be 95% confident of its results. Does the sample proportion obtained from the blind taste-test, nine out of fifty, fall within the margin of error developed from the simulation? Justify your answer. The company decides to continue developing the product even though only nine out of fifty participants preferred its brand of cola in the taste-test. Describe how the simulation data could be used to support this decision.

- 763 Sonja is cutting wire to construct a mobile. She cuts 100 inches for the first piece, 80 inches for the second piece, and 64 inches for the third piece. Assuming this pattern continues, write an explicit equation for  $a_n$ , the length in inches of the  $n$ th piece. Sonja only has 40 feet of wire to use for the project and wants to cut 20 pieces total for the mobile using her pattern. Will she have enough wire? Justify your answer.

- 764 In a random sample of 250 men in the United States, age 21 or older, 139 are married. The graph below simulated samples of 250 men, 200 times, assuming that 139 of the men are married.



- a) Based on the simulation, create an interval in which the middle 95% of the number of married men may fall. Round your answer to the *nearest integer*.
- b) A study claims "50 percent of men 21 and older in the United States are married." Do your results from part a contradict this claim? Explain.

- 765 Monthly mortgage payments can be found using the formula below:

$$M = \frac{P \left( \frac{r}{12} \right) \left( 1 + \frac{r}{12} \right)^n}{\left( 1 + \frac{r}{12} \right)^n - 1}$$

$M$  = monthly payment

$P$  = amount borrowed

$r$  = annual interest rate

$n$  = number of monthly payments

The Banks family would like to borrow \$120,000 to purchase a home. They qualified for an annual interest rate of 4.8%. Algebraically determine the *fewest* number of whole years the Banks family would need to include in the mortgage agreement in order to have a monthly payment of no more than \$720.

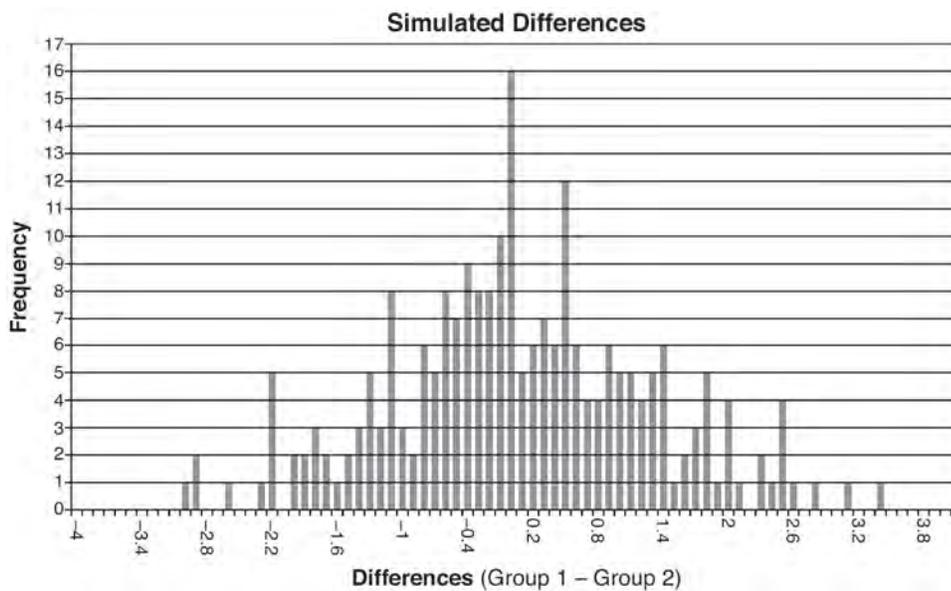
Algebra II 4 Point Regents Exam Questions

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766 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

| Group 1<br>(seconds) | Group 2<br>(seconds) |
|----------------------|----------------------|
| 17.4                 | 23.3                 |
| 18.1                 | 18.8                 |
| 18.2                 | 22.1                 |
| 19.6                 | 12.7                 |
| 18.6                 | 16.9                 |
| 16.2                 | 24.4                 |
| 16.1                 | 21.2                 |
| 15.3                 | 21.2                 |
| 17.8                 | 16.3                 |
| 19.7                 | 14.5                 |
| Mean = 17.7          | Mean = 19.1          |

Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva’s hypothesis may be *incorrect*. Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



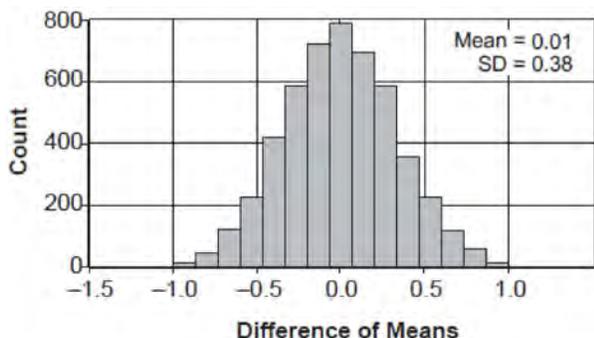
Ayva has decided that the difference in mean reading times is not an unusual occurrence. Support her decision using the results of the simulation. Explain your reasoning.

767 The table below gives air pressures in kPa at selected altitudes above sea level measured in kilometers.

| x | Altitude (km)      | 0   | 1  | 2  | 3  | 4  | 5  |
|---|--------------------|-----|----|----|----|----|----|
| y | Air Pressure (kPa) | 101 | 90 | 79 | 70 | 62 | 54 |

Write an exponential regression equation that models these data rounding all values to the *nearest thousandth*. Use this equation to algebraically determine the altitude, to the *nearest hundredth* of a kilometer, when the air pressure is 29 kPa.

768 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*. Does the interval indicate that the difference between the classes' grades is significant? Explain.

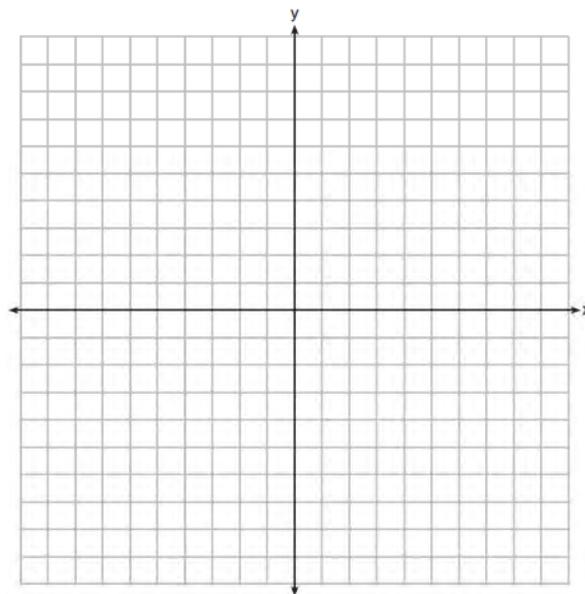
769 The height,  $h(t)$  in cm, of a piston, is given by the equation  $h(t) = 12 \cos\left(\frac{\pi}{3} t\right) + 8$ , where  $t$  represents the number of seconds since the measurements began. Determine the average rate of change, in cm/sec, of the piston's height on the interval  $1 \leq t \leq 2$ . At what value(s) of  $t$ , to the *nearest tenth of a second*, does  $h(t) = 0$  in the interval  $1 \leq t \leq 5$ ? Justify your answer.

770 The guidance department has reported that of the senior class, 2.3% are members of key club,  $K$ , 8.6% are enrolled in AP Physics,  $P$ , and 1.9% are in both. Determine the probability of  $P$  given  $K$ , to the *nearest tenth of a percent*. The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

771 On the set of axes below, graph  $y = f(x)$  and  $y = g(x)$  for the given functions.

$$f(x) = x^3 - 3x^2$$

$$g(x) = 2x - 5$$



State the number of solutions to the equation  $f(x) = g(x)$ .

Algebra II 4 Point Regents Exam Questions

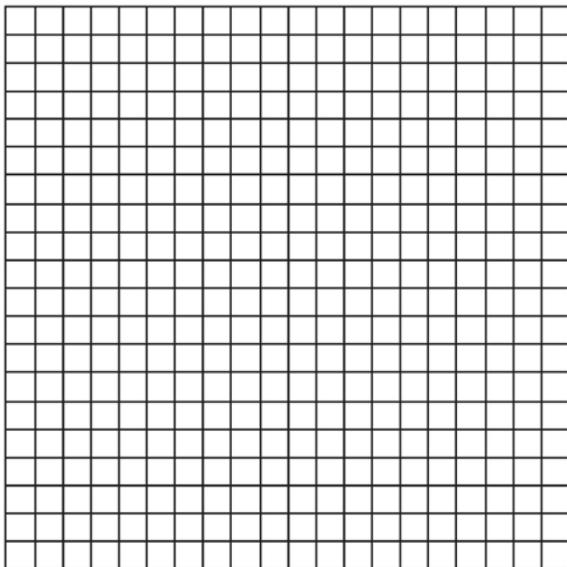
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- 772 Using a microscope, a researcher observed and recorded the number of bacteria spores on a large sample of uniformly sized pieces of meat kept at room temperature. A summary of the data she recorded is shown in the table below.

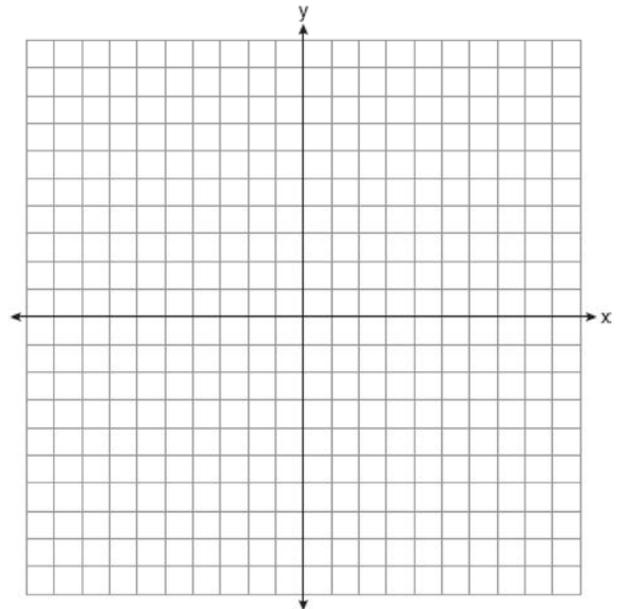
| Hours (x) | Average Number of Spores (y) |
|-----------|------------------------------|
| 0         | 4                            |
| 0.5       | 10                           |
| 1         | 15                           |
| 2         | 60                           |
| 3         | 260                          |
| 4         | 1130                         |
| 6         | 16,380                       |

Using these data, write an exponential regression equation, rounding all values to the *nearest thousandth*. The researcher knows that people are likely to suffer from food-borne illness if the number of spores exceeds 100. Using the exponential regression equation, determine the maximum amount of time, to the *nearest quarter hour*, that the meat can be kept at room temperature safely.

- 773 Determine an equation for the parabola with focus  $(4, -1)$  and directrix  $y = -5$ . (Use of the grid below is optional.)



- 775 Graph  $y = f(x)$ , where  $f(x) = \log_2(x - 1) + 3$  on the set of axes below.



- 774 Solve the system of equations shown below algebraically:

$$(x - 4)^2 + (y - 1)^2 = 9$$

$$x - y = 6$$

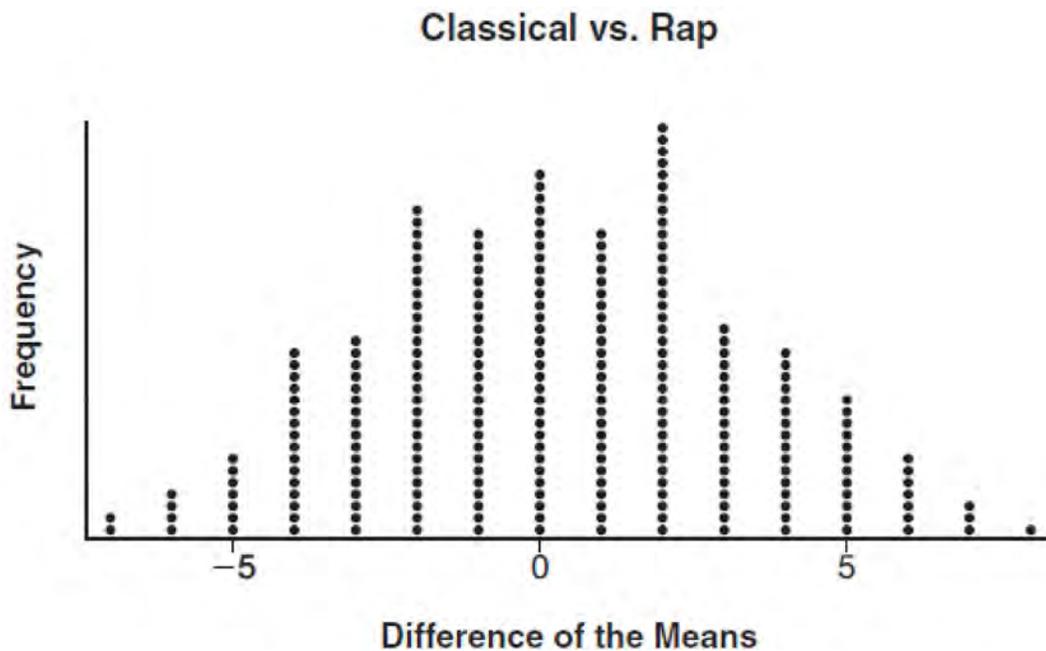
State the equation of the asymptote of  $f(x)$ . When  $f(x)$  is reflected over the line  $y = x$ , a new function is formed:  $g(x) = 2^{x-3} + 1$ . State the equation of the asymptote of  $g(x)$ .

776 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90, 89

Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer. To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.



Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

777 Which function has a greater average rate of change on the interval  $[-1,4]$ ? Justify your answer.

| $x$ | $m(x)$ |
|-----|--------|
| -2  | -3     |
| -1  | 1      |
| 0   | 1      |
| 1   | 3      |
| 2   | 13     |
| 3   | 37     |
| 4   | 81     |
| 5   | 151    |

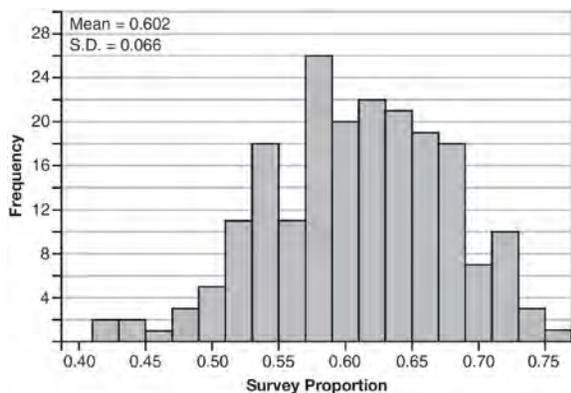
$$p(x) = 3^x + 1$$

Algebra II 4 Point Regents Exam Questions

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778 On a certain tropical island, there are currently 500 palm trees and 200 flamingos. Suppose the palm tree population is decreasing at an annual rate of 3% per year and the flamingo population is growing at a continuous rate of 2% per year. Write two functions,  $P(x)$  and  $F(x)$ , that represent the number of palm trees and flamingos on this island, respectively,  $x$  years from now. State the solution to the equation  $P(x) = F(x)$ , rounded to the *nearest year*. Interpret the meaning of this value within the given context.

779 Fifty-five students attending the prom were randomly selected to participate in a survey about the music choice at the prom. Sixty percent responded that a DJ would be preferred over a band. Members of the prom committee thought that the vote would have 50% for the DJ and 50% for the band. A simulation was run 200 times, each of sample size 55, based on the premise that 60% of the students would prefer a DJ. The approximate normal simulation results are shown below.

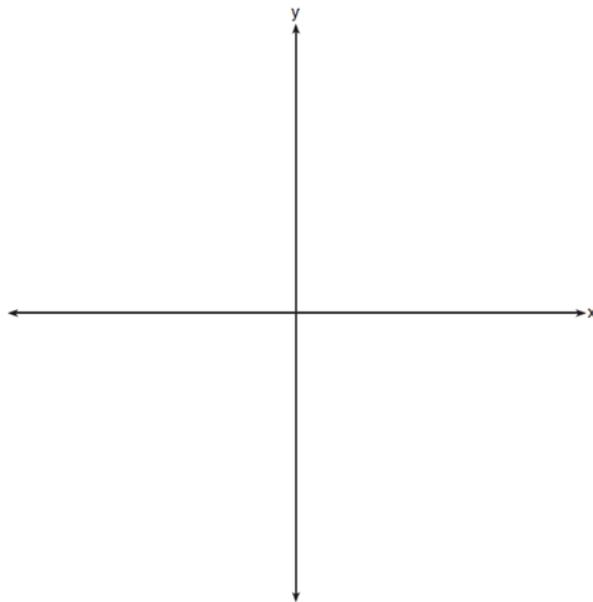


Using the results of the simulation, determine a plausible interval containing the middle 95% of the data. Round all values to the *nearest hundredth*. Members of the prom committee are concerned that a vote of all students attending the prom may produce a 50% – 50% split. Explain what statistical evidence supports this concern.

780 Given  $z(x) = 6x^3 + bx^2 - 52x + 15$ ,  $z(2) = 35$ , and  $z(-5) = 0$ , algebraically determine all the zeros of  $z(x)$ .

781 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function,  $C(t)$ , that represents the amount of money in the account  $t$  years after the account is opened, given that no more money is deposited into or withdrawn from the account. Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

782 a) On the axes below, sketch *at least one* cycle of a sine curve with an amplitude of 2, a midline at  $y = -\frac{3}{2}$ , and a period of  $2\pi$ .



b) Explain any differences between a sketch of  $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$  and the sketch from part a.

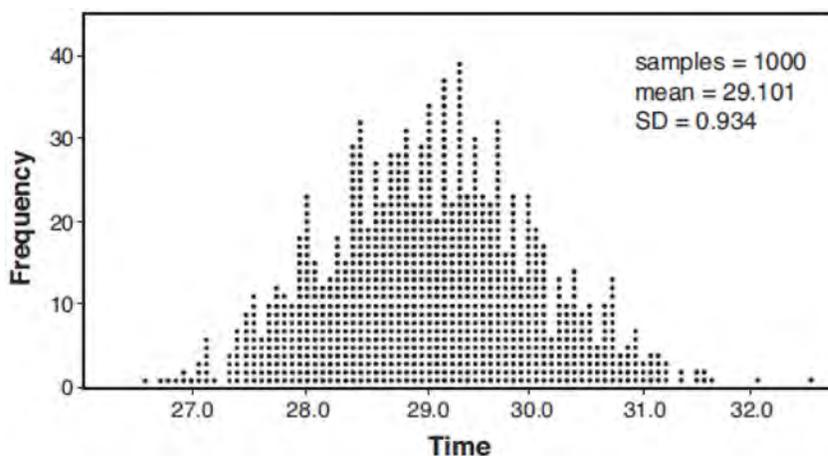
Algebra II 4 Point Regents Exam Questions

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- 783 A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

|           |        |
|-----------|--------|
| $\bar{x}$ | 29.11  |
| $s_x$     | 20.718 |

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

- 784 After sitting out of the refrigerator for a while, a turkey at room temperature ( $68^{\circ}\text{F}$ ) is placed into an oven at 8 a.m., when the oven temperature is  $325^{\circ}\text{F}$ . Newton's Law of Heating explains that the temperature of the turkey will increase proportionally to the difference between the temperature of the turkey and the temperature of the oven, as given by the formula below:

$$T = T_a + (T_0 - T_a)e^{-kt}$$

$T_a$  = the temperature surrounding the object

$T_0$  = the initial temperature of the object

$t$  = the time in hours

$T$  = the temperature of the object after  $t$  hours

$k$  = decay constant

The turkey reaches the temperature of approximately  $100^{\circ}\text{F}$  after 2 hours. Find the value of  $k$ , to the *nearest thousandth*, and write an equation to determine the temperature of the turkey after  $t$  hours. Determine the Fahrenheit temperature of the turkey, to the *nearest degree*, at 3 p.m.

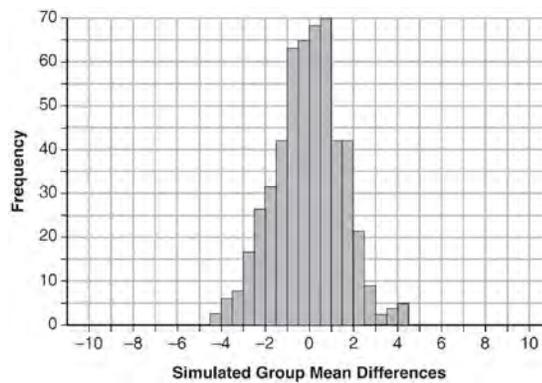
Algebra II 4 Point Regents Exam Questions

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785 Seventy-two students are randomly divided into two equally-sized study groups. Each member of the first group (group 1) is to meet with a tutor after school twice each week for one hour. The second group (group 2), is given an online subscription to a tutorial account that they can access for a maximum of two hours each week. Students in both groups are given the same tests during the year. A summary of the two groups' final grades is shown below:

|           | Group 1 | Group 2 |
|-----------|---------|---------|
| $\bar{x}$ | 80.16   | 83.8    |
| $S_x$     | 6.9     | 5.2     |

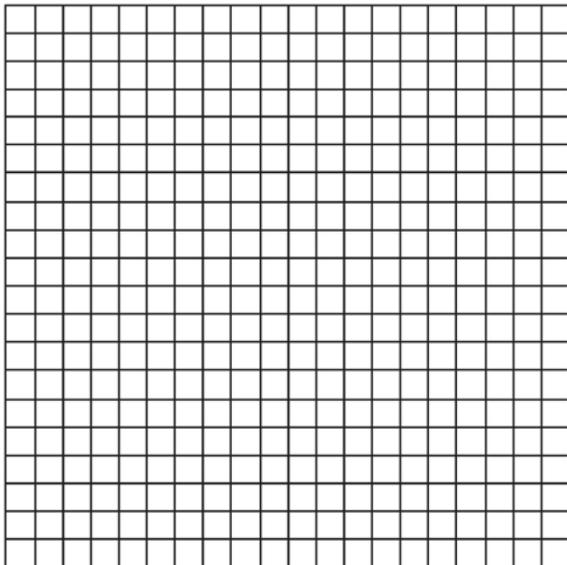
Calculate the mean difference in the final grades (group 1 – group 2) and explain its meaning in the context of the problem. A simulation was conducted in which the students' final grades were rerandomized 500 times. The results are shown below.



Use the simulation to determine if there is a significant difference in the final grades. Explain your answer.

**Algebra II 6 Point Regents Exam Questions**

- 1 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function  $f(t) = -13 \cos(0.8\pi t) + 13$ , where  $t$  represents the time (in seconds) since the nail first became caught in the tire. Determine the period of  $f(t)$ . Interpret what the period represents in this context. On the grid below, graph *at least one* cycle of  $f(t)$  that includes the  $y$ -intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

- 2 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option A will pay him 4.5% interest compounded annually. Option B will pay him 4.6% compounded quarterly. Write a function of option A and option B that calculates the value of each account after  $n$  years. Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option B will earn than option A to the *nearest cent*. Algebraically determine, to the *nearest tenth of a year*, how long it would take for option B to double Seth's initial investment.

- 3 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states  $T(t) = T_a + (T_0 - T_a)e^{-kt}$  where:

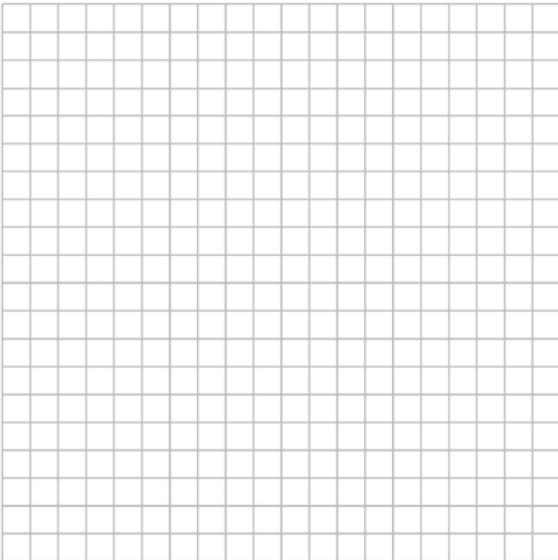
- $T(t)$ : temperature, °F, of the liquid at  $t$  hours
- $T_a$ : air temperature
- $T_0$ : initial temperature of the liquid
- $k$ : constant

Determine the value of  $k$ , to the *nearest thousandth*, for this liquid. Determine the temperature of the liquid using your value for  $k$ , to the *nearest degree*, after two and a half hours. Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for  $k$  to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

Algebra II 6 Point Regents Exam Questions

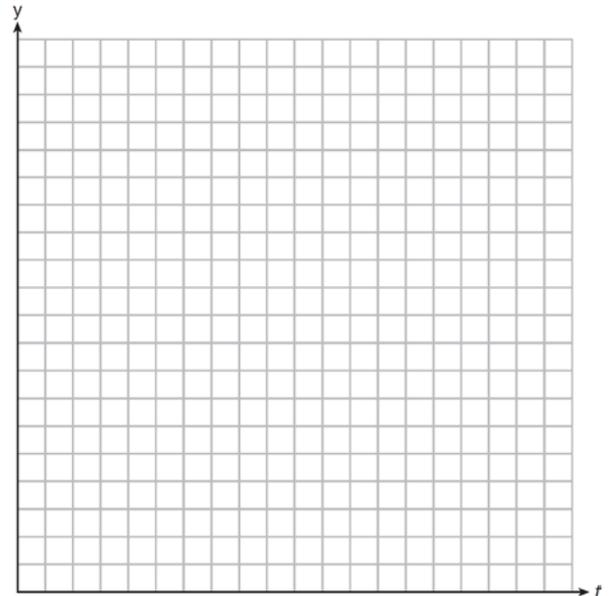
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- 4 The ocean tides near Carter Beach follow a repeating pattern over time, with the amount of time between each low and high tide remaining relatively constant. On a certain day, low tide occurred at 8:30 a.m. and high tide occurred at 3:00 p.m. At high tide, the water level was 12 inches above the average local sea level; at low tide it was 12 inches below the average local sea level. Assume that high tide and low tide are the maximum and minimum water levels each day, respectively. Write a cosine function of the form  $f(t) = A \cos(Bt)$ , where  $A$  and  $B$  are real numbers, that models the water level,  $f(t)$ , in inches above or below the average Carter Beach sea level, as a function of the time measured in  $t$  hours since 8:30 a.m. On the grid below, graph one cycle of this function.



People who fish in Carter Beach know that a certain species of fish is most plentiful when the water level is increasing. Explain whether you would recommend fishing for this species at 7:30 p.m. or 10:30 p.m. using evidence from the given context.

- 5 Drugs break down in the human body at different rates and therefore must be prescribed by doctors carefully to prevent complications, such as overdosing. The breakdown of a drug is represented by the function  $N(t) = N_0(e)^{-rt}$ , where  $N(t)$  is the amount left in the body,  $N_0$  is the initial dosage,  $r$  is the decay rate, and  $t$  is time in hours. Patient A,  $A(t)$ , is given 800 milligrams of a drug with a decay rate of 0.347. Patient B,  $B(t)$ , is given 400 milligrams of another drug with a decay rate of 0.231. Write two functions,  $A(t)$  and  $B(t)$ , to represent the breakdown of the respective drug given to each patient. Graph each function on the set of axes below.



To the *nearest hour*,  $t$ , when does the amount of the given drug remaining in patient B begin to exceed the amount of the given drug remaining in patient A? The doctor will allow patient A to take another 800 milligram dose of the drug once only 15% of the original dose is left in the body. Determine, to the *nearest tenth of an hour*, how long patient A will have to wait to take another 800 milligram dose of the drug.

Algebra II 6 Point Regents Exam Questions

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- 6 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the

form  $A = A_0 \left( \frac{1}{2} \right)^{\frac{t}{h}}$  that models this situation,

where  $h$  is the constant representing the number of hours in the half-life,  $A_0$  is the initial mass, and  $A$  is the mass  $t$  hours after 3 p.m. Using this equation, solve for  $h$ , to the *nearest ten thousandth*. Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

- 7 Sarah is fighting a sinus infection. Her doctor prescribed a nasal spray and an antibiotic to fight the infection. The active ingredients, in milligrams, remaining in the bloodstream from the nasal spray,  $n(t)$ , and the antibiotic,  $a(t)$ , are modeled in the functions below, where  $t$  is the time in hours since the medications were taken.

$$n(t) = \frac{t+1}{t+5} + \frac{18}{t^2 + 8t + 15}$$

$$a(t) = \frac{9}{t+3}$$

Determine which drug is made with a greater initial amount of active ingredient. Justify your answer. Sarah's doctor told her to take both drugs at the same time. Determine algebraically the number of hours after taking the medications when both medications will have the same amount of active ingredient remaining in her bloodstream.

- 8 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested \$8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously. Write a function,  $A(t)$ , for Abby's account and a function,  $B(t)$ , for Brett's account that calculates the value of each account after  $t$  years. Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*. Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

- 9 The population, in millions of people, of the United States can be represented by the recursive formula below, where  $a_0$  represents the population in 1910 and  $n$  represents the number of years since 1910.

$$a_0 = 92.2$$

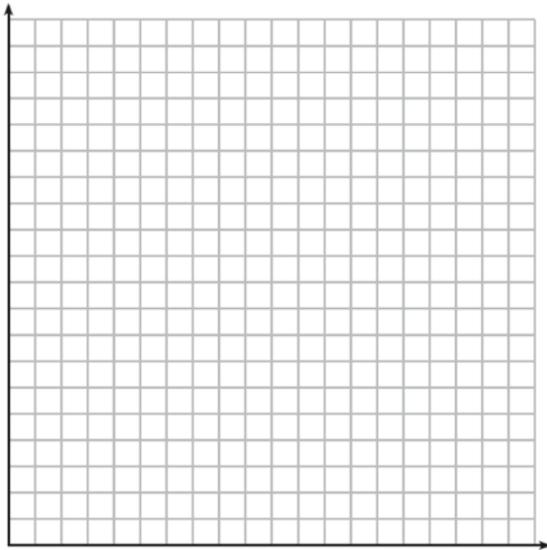
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation  $a_n = 1.015a_{n-1}$ . Write an exponential function,  $P$ , where  $P(t)$  represents the United States population in millions of people, and  $t$  is the number of years since 1910. According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

Algebra II 6 Point Regents Exam Questions

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- 10 The value of a certain small passenger car based on its use in years is modeled by  $V(t) = 28482.698(0.684)^t$ , where  $V(t)$  is the value in dollars and  $t$  is the time in years. Zach had to take out a loan to purchase the small passenger car. The function  $Z(t) = 22151.327(0.778)^t$ , where  $Z(t)$  is measured in dollars, and  $t$  is the time in years, models the unpaid amount of Zach's loan over time. Graph  $V(t)$  and  $Z(t)$  over the interval  $0 \leq t \leq 5$ , on the set of axes below.



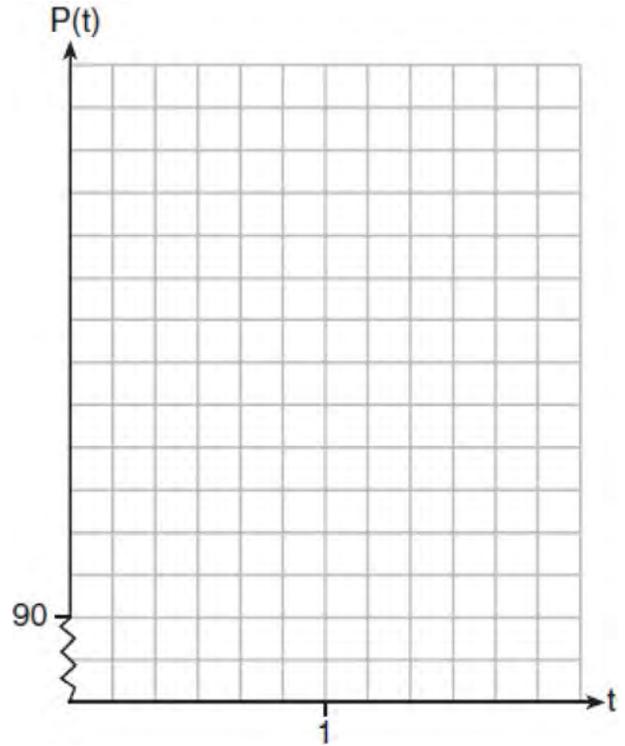
State when  $V(t) = Z(t)$ , to the *nearest hundredth*, and interpret its meaning in the context of the problem. Zach takes out an insurance policy that requires him to pay a \$3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year*, how long will it take Zach to cancel this policy? Justify your answer.

- 11 The speed of a tidal wave,  $s$ , in hundreds of miles per hour, can be modeled by the equation  $s = \sqrt{t} - 2t + 6$ , where  $t$  represents the time from its origin in hours. Algebraically determine the time when  $s = 0$ . How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

- 12 The resting blood pressure of an adult patient can be modeled by the function  $P$  below, where  $P(t)$  is the pressure in millimeters of mercury after time  $t$  in seconds.

$$P(t) = 24 \cos(3\pi t) + 120$$

On the set of axes below, graph  $y = P(t)$  over the domain  $0 \leq t \leq 2$ .



Determine the period of  $P$ . Explain what this value represents in the given context. Normal resting blood pressure for an adult is 120 over 80. This means that the blood pressure oscillates between a maximum of 120 and a minimum of 80. Adults with high blood pressure (above 140 over 90) and adults with low blood pressure (below 90 over 60) may be at risk for health disorders. Classify the given patient's blood pressure as low, normal, or high and explain your reasoning.

Algebra II 6 Point Regents Exam Questions

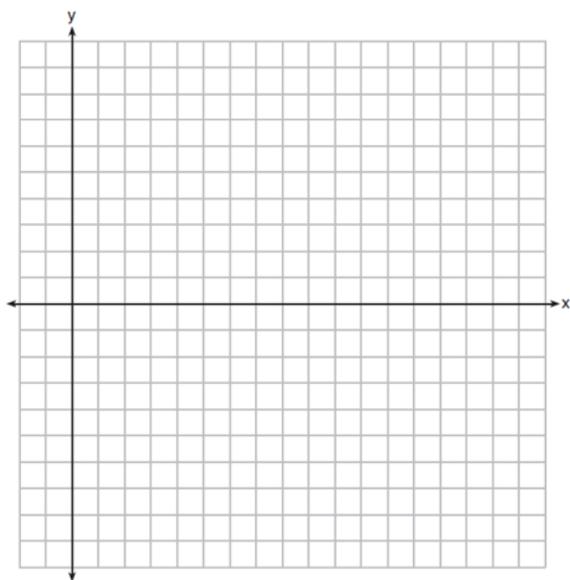
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- 13 A major car company analyzes its revenue,  $R(x)$ , and costs  $C(x)$ , in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years,  $x$ , using the given functions.

$$R(x) = 550x^3 - 12,000x^2 + 83,000x + 7000$$

$$C(x) = 880x^3 - 21,000x^2 + 150,000x - 160,000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function,  $P(x)$ , as a polynomial in standard form. Graph  $y = P(x)$  on the set of axes below over the domain  $2 \leq x \leq 16$ .



Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

- 14 Titanium-44 is a radioactive isotope such that every 63 years, its mass decreases by half. For a sample of titanium-44 with an initial mass of 100 grams, write a function that will give the mass of the sample remaining after any amount of time. Define all variables. Scientists sometimes use the average yearly decrease in mass for estimation purposes. Use the average yearly decrease in mass of the sample between year 0 and year 10 to predict the amount of the sample remaining after 40 years. Round your answer to the *nearest tenth*. Is the actual mass of the sample or the estimated mass greater after 40 years? Justify your answer.

- 15 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

$T_0$ : initial temperature

$T_R$ : room temperature

$r$ : rate of cooling of the object

$t$ : time in minutes that the object

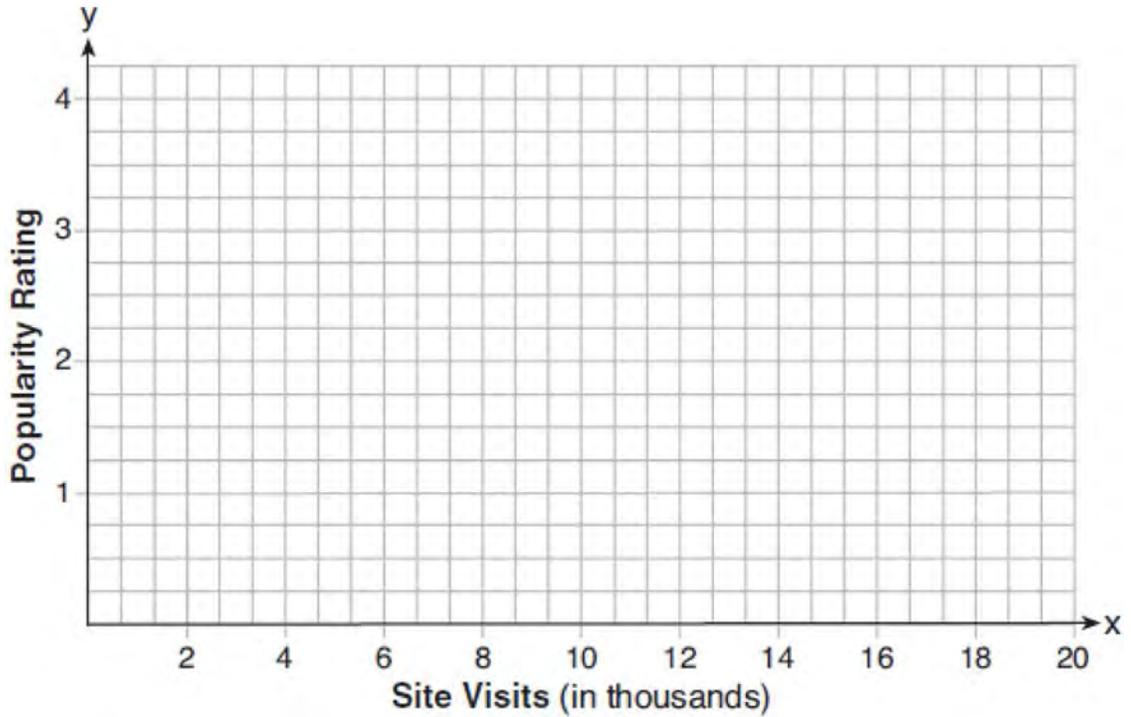
cools to a temperature,  $T$

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to  $400^\circ\text{F}$ . The rate of cooling for the shirt is 0.0735 and the room temperature is  $75^\circ\text{F}$ . Using this information, write an equation for the temperature of the shirt,  $T$ , after  $t$  minutes. Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes. At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to  $450^\circ\text{F}$ . After eight minutes, the hoodie measured  $270^\circ\text{F}$ . The room temperature is still  $75^\circ\text{F}$ . Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*. The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

Algebra II 6 Point Regents Exam Questions

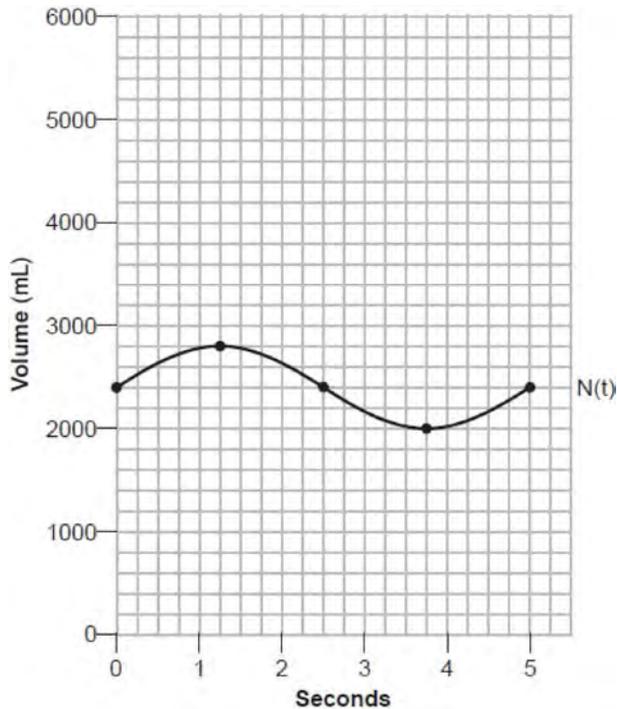
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- 16 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is  $P(x) = \log(x - 4)$ , where  $x$  is the number of visits per week in thousands and  $P(x)$  is the website's popularity rating. According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*? Graph  $y = P(x)$  on the axes below.



An alternative rating model is represented by  $R(x) = \frac{1}{2}x - 6$ , where  $x$  is the number of visits per week in thousands. Graph  $R(x)$  on the same set of axes. For what number of weekly visits will the two models provide the same rating?

- 17 The volume of air in an average lung during breathing can be modeled by the graph below.

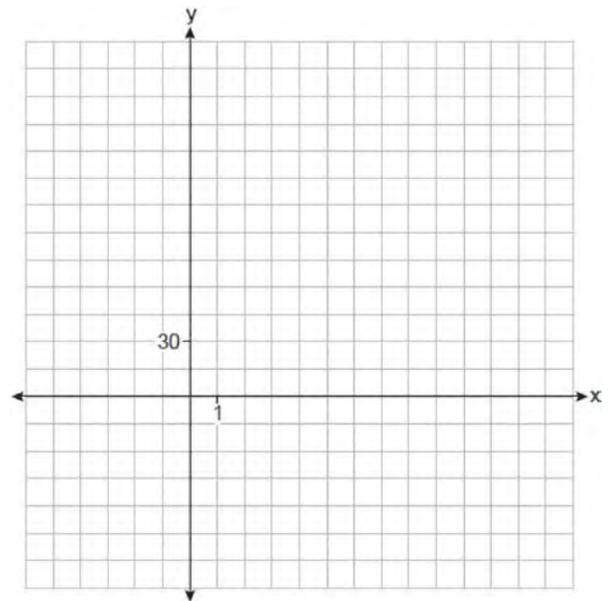


Using the graph, write an equation for  $N(t)$ , in the form  $N(t) = A \sin(Bt) + C$ . That same lung, when engaged in exercise, has a volume that can be modeled by  $E(t) = 2000 \sin(\pi t) + 3200$ , where  $E(t)$  is volume in mL and  $t$  is time in seconds. Graph *at least one* cycle of  $E(t)$  on the same grid as  $N(t)$ . How many times during the 5-second interval will  $N(t) = E(t)$ ?

- 18 A manufacturer of sweatshirts finds that profits and costs fluctuate depending on the number of products created. Creating more products doesn't always increase profits because it requires additional costs, such as building a larger facility or hiring more workers. The manufacturer determines the profit,  $p(x)$ , in thousands of dollars, as a function of the number of sweatshirts sold,  $x$ , in thousands. This function,  $p$ , is given below.

$$p(x) = -x^3 + 11x^2 - 7x - 69$$

Graph  $y = p(x)$ , over the interval  $0 \leq x \leq 9$ , on the set of axes below.

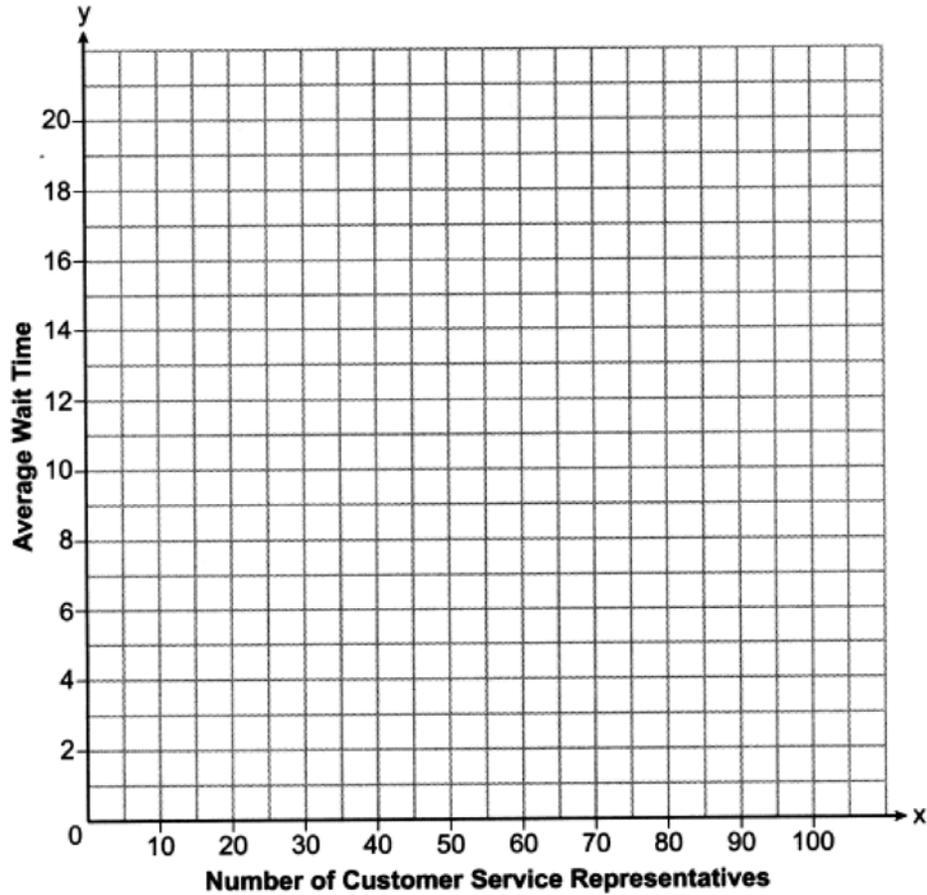


Over the given interval, state the coordinates of the maximum of  $p$  and round all values to the *nearest integer*. Explain what this point represents in terms of the number of sweatshirts sold and profit. Determine how many sweatshirts, to the *nearest whole sweatshirt*, the manufacturer would need to produce in order to first make a positive profit. Justify your answer.

Algebra II 6 Point Regents Exam Questions

[www.jmap.org](http://www.jmap.org)

- 19 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function  $A(x) = 15.7(0.98)^x$  and plan B can be modeled by the function  $B(x) = 11(0.99)^x$  where  $x$  is the number of customer service representatives employed by the company and  $A(x)$  and  $B(x)$  represent the average wait time, in minutes, of each customer. Graph  $A(x)$  and  $B(x)$  in the interval  $0 \leq x \leq 100$  on the set of axes below.

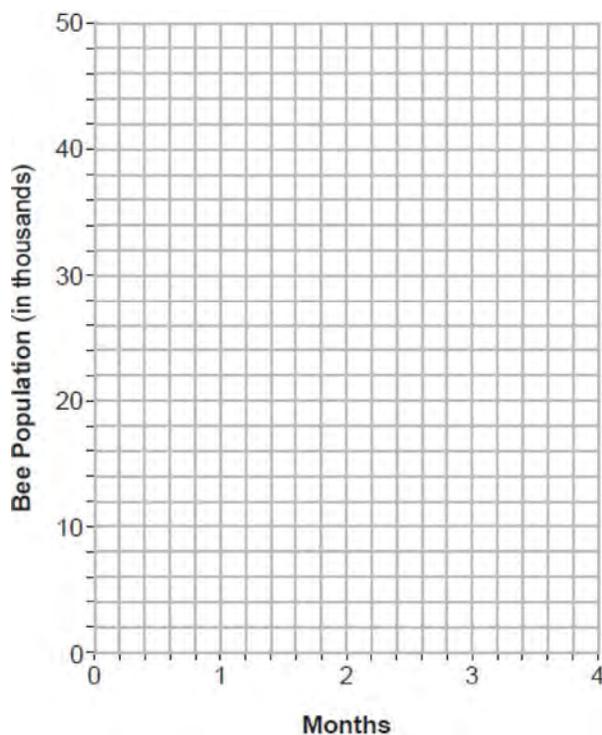


To the *nearest integer*, solve the equation  $A(x) = B(x)$ . Determine, to the *nearest minute*,  $B(100) - A(100)$ . Explain what this value represents in the given context.

Algebra II 6 Point Regents Exam Questions

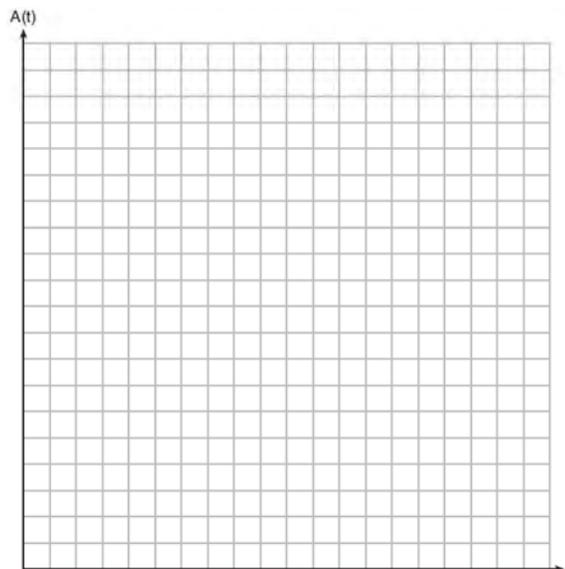
[www.jmap.org](http://www.jmap.org)

- 20 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by  $P(t) = P_0 e^{rt}$ , where  $P(t)$  is the colony population of bees at  $t$  months,  $P_0$  is the initial population, and  $r$  is the growth rate. Colony  $A$  has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony  $B$  has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both  $A(t)$  and  $B(t)$  that model the honeybee populations of the colonies after  $t$  months. Graph  $A(t)$  and  $B(t)$  for  $0 \leq t \leq 4$ .



State, to the *nearest tenth of a month*, when the colonies will have the same population. Determine algebraically how long it will take, to the *nearest tenth of a month*, for the population in Colony  $A$  to triple.

- 21 Tony is evaluating his retirement savings. He currently has \$318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account. Write a function,  $A(t)$ , to represent the amount of money that will be in his account in  $t$  years. Graph  $A(t)$  where  $0 \leq t \leq 20$  on the set of axes below.



Tony's goal is to save \$1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal. Explain how your graph of  $A(t)$  confirms your answer.

- 22 The Beaufort Wind Scale was devised by British Rear Admiral Sir Francis Beaufort, in 1805 based upon observations of the effects of the wind. Beaufort numbers,  $B$ , are determined by the equation  $B = 1.69\sqrt{s + 4.45} - 3.49$ , where  $s$  is the speed of the wind in mph, and  $B$  is rounded to the nearest integer from 0 to 12.

| Beaufort Wind Scale |                 |
|---------------------|-----------------|
| Beaufort Number     | Force of Wind   |
| 0                   | Calm            |
| 1                   | Light air       |
| 2                   | Light breeze    |
| 3                   | Gentle breeze   |
| 4                   | Moderate breeze |
| 5                   | Fresh breeze    |
| 6                   | Steady breeze   |
| 7                   | Moderate gale   |
| 8                   | Fresh gale      |
| 9                   | Strong gale     |
| 10                  | Whole gale      |
| 11                  | Storm           |
| 12                  | Hurricane       |

Using the table above, classify the force of wind at a speed of 30 mph. Justify your answer. In 1946, the scale was extended to accommodate strong hurricanes. A strong hurricane received a  $B$  value of exactly 15. Algebraically determine the value of  $s$ , to the *nearest mph*. Any  $B$  values that round to 10 receive a Beaufort number of 10. Using technology, find an approximate range of wind speeds, to the *nearest mph*, associated with a Beaufort number of 10.

- 23 Taylor wants to open an investment account with the \$1200 she received for her birthday. She has narrowed her choices down to two banks. America's Bank offers 6.4% annual interest compounded quarterly. Barnyard Bank offers 6.35% annual interest compounded continuously. Write functions for  $A(t)$  and  $B(t)$  to represent the value of her investment with America's Bank and Barnyard Bank as a function of time,  $t$ , in years. Taylor would like to invest the \$1200 into one bank for ten years making no additional deposits and no withdrawals. With which bank will Taylor earn the most money? Justify your answer. Taylor chooses to invest her money in Barnyard Bank. Algebraically determine how long, to the *nearest tenth of a year*, it will take her initial investment to triple assuming she makes no deposits or withdrawals.

## Algebra II Multiple Choice Regents Exam Questions Answer Section

- 1 ANS: 1 REF: 012405aia NAT: A.APR.B.3 TOP: Graphing Polynomial Functions  
 2 ANS: 1 REF: 062318aia NAT: F.BF.B.3 TOP: Even and Odd Functions  
 3 ANS: 1 REF: 082414aia NAT: F.IF.B.4 TOP: Graphing Polynomial Functions  
 4 ANS: 1 REF: 082406aia NAT: S.ID.B.6 TOP: Regression

KEY: choose model

- 5 ANS: 1

$$1 + \frac{0.027}{12} = 1.00225$$

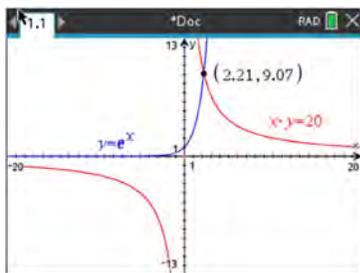
REF: 082403aia NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

- 6 ANS: 3

$$S_{20} = \frac{-2 - (-2)(-3)^{20}}{1 - (-3)} = 1,743,392,200$$

REF: 012306aia NAT: F.BF.B.7 TOP: Series KEY: geometric

- 7 ANS: 1



REF: 082210aia NAT: A.REI.D.11 TOP: Other Systems

KEY: rational

- 8 ANS: 3

$$x^8 - y^8 = (x^4 + y^4)(x^4 - y^4) = (x^4 + y^4)(x^2 + y^2)(x^2 - y^2) = (x^4 + y^4)(x^2 + y^2)(x + y)(x - y)$$

REF: 082423aia NAT: A.SSE.A.2 TOP: Factoring Polynomials

- 9 ANS: 3

$$e^{\left(-\frac{3}{0.6}\right)} \approx 0.006738$$

REF: 062315aia NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

- 10 ANS: 3

To determine student opinion, survey the widest range of students.

REF: 062202aia NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

11 ANS: 1

The probability of being late given that a student walked is  $\frac{4}{22}$ . The probability that student walked given that the student was late is  $\frac{4}{30}$ .

REF: 012518aai NAT: S.CP.A.4 TOP: Conditional Probability

12 ANS: 1 REF: 062214aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: predict

13 ANS: 3

$$x^2 - 6x + 9 - (x^2 + 6x + 9) = -12x$$

REF: 062210aai NAT: F.BF.A.1 TOP: Operations with Functions

14 ANS: 3

$$r = \frac{-2\sqrt{3}}{\sqrt{6}} = \frac{-2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{-2\sqrt{2}}{2} = -\sqrt{2} \quad a_7 = \sqrt{6}(-\sqrt{2})^{7-1} = \sqrt{6}(-\sqrt{2})^6 = \sqrt{6} \cdot 2^3 = 8\sqrt{6}$$

REF: 012410aai NAT: F.BF.A.2 TOP: Sequences KEY: explicit

15 ANS: 4

(1) and (3) are not recursive

REF: 012013aai NAT: F.BF.A.2 TOP: Sequences KEY: recursive

16 ANS: 1

Distance from the focus to the directrix is 2, so  $p = 1$ . Vertex is  $(-3, 1)$ .  $y = \frac{1}{4(1)}(x + 3)^2 + 1$

REF: 012409aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

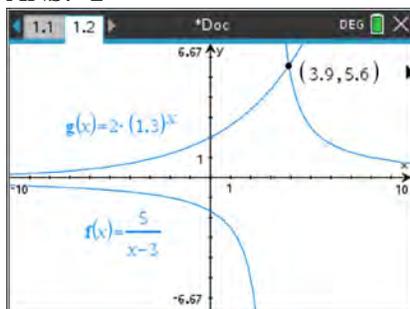
17 ANS: 2 REF: 082204aai NAT: S.IC.B.3 TOP: Analysis of Data

18 ANS: 4

$$M = \frac{45000 \left( \frac{6.75\%}{12} \right) \left( 1 + \frac{6.75\%}{12} \right)^{5 \times 12}}{\left( 1 + \frac{6.75\%}{12} \right)^{5 \times 12} - 1} \approx 885.76$$

REF: 082316aai NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

19 ANS: 2



REF: 062402aai NAT: A.REI.D.11 TOP: Other Systems

KEY: rational

20 ANS: 4

$$(x^2 - y^2) + (2xy)^2 = x^2 + 4x^2y^2 - y^2$$

$$(x - y) + (x^2 - xy + y^2) = x^2 + x - y - xy + y^2$$

$$(x - y)(x - y)(x^2 + y^2) = (x^2 - 2xy + y^2)(x^2 + y^2) = x^4 - 2x^3y + x^2y^2 + x^2y^2 - 2xy^3 + y^4$$

REF: 062322aai NAT: A.APR.C.4 TOP: Polynomial Identities

21 ANS: 3

$$x = -\frac{2y}{5} + 4 \quad y = -\frac{5}{2}(6) + 10 = -5$$

$$5x = -2y + 20$$

$$2y = -5x + 20$$

$$y = -\frac{5}{2}x + 10$$

REF: 082223aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

22 ANS: 3

$$x = \frac{2}{3}y + \frac{1}{6}$$

$$6x = 4y + 1$$

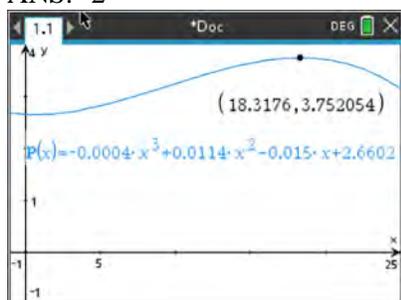
$$4y = 6x - 1$$

$$y = \frac{6}{4}x - \frac{1}{4}$$

REF: 062321aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

23 ANS: 2



REF: 012414aai NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

24 ANS: 2 REF: 062222aai NAT: F.IF.C.9 TOP: Comparing Functions

25 ANS: 2

$$4x^2 - 7x + 8 = 0 \quad x = \frac{7 \pm \sqrt{(-7)^2 - 4(4)(8)}}{2(4)} = \frac{7 \pm \sqrt{-79}}{8}$$

REF: 012507aai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

26 ANS: 2

$$\frac{x^2 + 3x}{x^2 + 5x + 6} = \frac{x(x+3)}{(x+2)(x+3)}$$

REF: 082215aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

27 ANS: 3

$$\frac{x^{\frac{1}{5}}}{x^{\frac{1}{2}}} = x^{\frac{1}{5} - \frac{1}{2}} = x^{-\frac{3}{10}} = \frac{1}{x^{\frac{3}{10}}} = \frac{1}{\sqrt[10]{x^3}}$$

REF: 012312aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

28 ANS: 1 REF: 062308aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

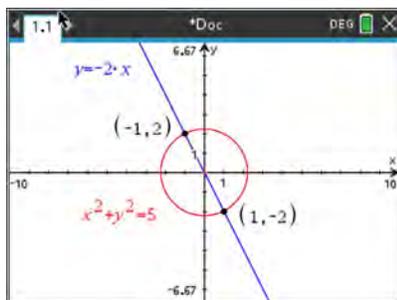
29 ANS: 3

$$y = 1.77(1.18)^x \quad y(41) \approx 1,850,950$$

REF: 062314aai NAT: S.ID.B.6 TOP: Regression KEY: exponential

30 ANS: 3 REF: 062302aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

31 ANS: 4



$$x^2 + (-2x)^2 = 5 \quad y = -2(-1) = 2$$

$$5x^2 = 5$$

$$x^2 = 1$$

$$x = \pm 1$$

REF: 012407aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

32 ANS: 1 REF: 082309aai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

33 ANS: 3 REF: 012015aai NAT: S.IC.B.3 TOP: Analysis of Data

34 ANS: 2

$$(x-1)^2 = 2x+6 \quad -1 \text{ is extraneous.}$$

$$x^2 - 2x + 1 = 2x + 6$$

$$x^2 - 4x - 5 = 0$$

$$(x-5)(x+1) = 0$$

$$x = 5, -1$$

REF: 082411aai NAT: A.REI.A.2 TOP: Solving Radicals

35 ANS: 4

$$z = 7y - 31 \quad 5x + 2y - (7y - 31) = -14 \rightarrow 5x - 5y = -45 \rightarrow x - y = -9 \rightarrow y = x + 9$$

$$5y + 4(7y - 31) - 5x = -23 \rightarrow -5x + 33y = 101$$

$$-5x + 33(x + 9) = 101$$

$$28x = -196$$

$$x = -7$$

REF: 012515aai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

36 ANS: 4

$$\frac{13}{13+11} = \frac{13}{24}$$

REF: 012011aai NAT: S.CP.A.4 TOP: Conditional Probability

37 ANS: 2

$$x^2 - 24 = x - 12 \quad y = -3 - 12 = -15$$

$$x^2 - x - 12 = 0$$

$$(x - 4)(x + 3) = 0$$

$$x = 4, -3$$

REF: 062404aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

38 ANS: 3

$$x + y + z = 2 \quad x - 2y - z = -4 \quad 2x - y = -2 \quad x + 2 + z = 2 \quad x + z = 0 \quad 0 + 2 + z = 2$$

$$\underline{x - 2y - z = -4} \quad \underline{x - 9y + z = -18} \quad \underline{2x - 11y = -22} \quad x - 2(2) - z = -4 \quad \underline{x - z = 0} \quad z = 0$$

$$2x - y = -2 \quad 2x - 11y = -22 \quad 10y = 20 \quad 2x = 0$$

$$y = 2 \quad x = 0$$

REF: 062311aai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

39 ANS: 1

$$2x + 4 \overline{) \begin{array}{r} x^2 - 2x + 5 \\ 2x^3 + 0x^2 + 2x - 7 \end{array}}$$

$$\underline{2x^3 + 4x^2}$$

$$-4x^2 + 2x$$

$$\underline{-4x^2 - 8x}$$

$$10x - 7$$

$$\underline{10x + 20}$$

$$-27$$

REF: 062313aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

40 ANS: 1

$$\text{amplitude} = \frac{8-2}{2} = 3, b = \frac{2\pi}{6} = \frac{\pi}{3}, c = \frac{8+2}{2} = 5$$

REF: 062403aai NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

41 ANS: 1

$$\left( 1.03^{\frac{1}{12}} \right)^{12t} \approx 1.00247^{12t}$$

REF: 062224aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

42 ANS: 2

$$p(x) = 4^x, q(x) = \left(\frac{5}{9}\right)^x, r(x) = 5.29^x, s(x) = 2^x$$

REF: 012304aai NAT: F.IF.C.7 TOP: Graphing Exponential Functions

43 ANS: 2 REF: 082222aai NAT: A.CED.A.1 TOP: Modeling Rationals

44 ANS: 2

$$V(x) = x(18 - 2x)(18 - 2x) = x(324 - 72x + 4x^2) = 324x - 72x^2 + 4x^3$$

REF: 082418aai NAT: F.BF.A.1 TOP: Operations with Functions

45 ANS: 3

$$2.12 \pm 2(.05)$$

REF: 012509aai NAT: S.ID.A.4 TOP: Normal Distributions

46 ANS: 2

$$i = \frac{6.24\%}{12} = .52\% \quad R = \frac{(18000)(.52\%)}{1 - (1 + .52\%)^{-12 \cdot 6}} \approx 300.36$$

REF: 012420aai NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

47 ANS: 2 REF: 062324aai NAT: F.BF.B.7 TOP: Series

KEY: geometric

48 ANS: 4

$$2 \times 0.035 = 0.07$$

REF: 012319aai NAT: S.IC.B.4 TOP: Analysis of Data

49 ANS: 2 REF: 082324aai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

50 ANS: 2

$$4300e^{0.07x} = 5123$$

$$\ln e^{0.07x} = \ln \frac{5123}{4300}$$

$$0.07x = \ln \frac{5123}{4300}$$

$$x = \frac{\ln \frac{5123}{4300}}{0.07}$$

$$x \approx 2.5$$

REF: 012302aai NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

51 ANS: 1

$$\cos \theta = -\frac{3}{5}; \sec \theta = -\frac{5}{3}$$

REF: 012421aai NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

52 ANS: 4

$$p(2) = 4(2)^3 - 3(2) + 3 = 29$$

REF: 062422aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

53 ANS: 4

$$F = 325 - 185e^{-0.4(0)} = 325 - 185 = 140$$

REF: 012415aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

54 ANS: 1

$$\frac{-12}{16} = \frac{9}{-12} = \frac{-6.75}{9}$$

REF: 012017aii NAT: F.IF.A.3 TOP: Sequences KEY: difference or ratio

55 ANS: 2

$$5x^2 - 4x + 2 = 0 \quad \frac{4 \pm \sqrt{(-4)^2 - 4(5)(2)}}{2(5)} = \frac{4 \pm \sqrt{-24}}{10} = \frac{4 \pm 2i\sqrt{6}}{10} = \frac{2 \pm i\sqrt{6}}{5}$$

REF: 012020aii NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

56 ANS: 1

$$\ln e^{x+2} = \ln \frac{7}{5}$$

$$(x+2)\ln e = \ln \frac{7}{5}$$

$$x = -2 + \ln \frac{7}{5}$$

REF: 062207aii NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

57 ANS: 3

The distance from the vertex to the focus,  $p$ , is 4. Since the focus is below the vertex,  $p$  is negative.

$$y = -\frac{1}{4(4)}(x-2)^2 + 1$$

REF: 082212aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

58 ANS: 2

$$2x \left( 2x + \frac{5}{2} = \frac{3}{x} \right)$$

$$4x^2 + 5x = 6$$

$$4x^2 + 5x - 6 = 0$$

$$(4x - 3)(x + 2) = 0$$

$$x = \frac{3}{4}, -2$$

REF: 012504aia NAT: A.REI.D.11 TOP: Other Systems

KEY: rational

59 ANS: 4

$$y = -(x - 1)^2 + 5 \quad 3 + y = 4$$

$$4 - x = -x^2 + 2x - 1 + 5 \quad y = 1$$

$$x^2 - 3x = 0$$

$$x(x - 3) = 0$$

$$x = 0, 3$$

REF: 082305aia NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

60 ANS: 3

$$6x + 8y - 10z = -54 \quad 6x + 8y - 10z = -54 \quad 6x + 9y - 3z = -9 \quad 10y - 7z = -12$$

$$6x + 9y - 3z = -9 \quad \underline{6x + 9y - 3z = -9} \quad \underline{6x - y + 4z = 3} \quad \underline{y + 7z = 45}$$

$$6x - y + 4z = 3 \quad \quad \quad y + 7z = 45 \quad 10y - 7z = -12 \quad 11y = 33$$

$$y = 3$$

REF: 082421aia NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

61 ANS: 2

REF: 012402aia

NAT: A.REI.B.4

TOP: Using the Discriminant

KEY: determine nature of roots

62 ANS: 2

$$3 \quad 1 \quad -1 \quad -21 \quad 45 \quad 0$$

$$\quad \quad \quad 3 \quad 6 \quad -45 \quad 0$$

$$\quad \quad 1 \quad 2 \quad -15 \quad 0 \quad 0$$

$$x^3 + 2x^2 - 15x = 0$$

$$x(x^2 + 2x - 15) = 0$$

$$x(x + 5)(x - 3) = 0$$

$$x = 0, -5, 3$$

REF: 012403aia NAT: A.APR.B.3 TOP: Solving Polynomial Equations

63 ANS: 3 REF: 082201aii NAT: S.IC.B.6 TOP: Analysis of Data  
KEY: draw conclusions

64 ANS: 3 REF: 012508aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

65 ANS: 3

$$\sqrt{x} \cdot \sqrt[4]{x^{11}} = x^{\frac{1}{2}} \cdot x^{\frac{11}{4}} = x^{\frac{2}{4}} \cdot x^{\frac{11}{4}} = x^{\frac{13}{4}}$$

REF: 012511aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

66 ANS: 2

$$x(x^3 + 4x^2 - 9x - 36)$$

$$x(x^2(x+4) - 9(x+4))$$

$$x(x^2 - 9)(x+4)$$

$$x(x+3)(x-3)(x+4)$$

REF: 062407aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

67 ANS: 3

$$x+2 \overline{) 2x^2 + 5x + 8}$$

$$\underline{2x^2 + 4x}$$

$$x + 8$$

$$\underline{x + 2}$$

$$6$$

REF: 012007aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

68 ANS: 1 REF: 012506aii NAT: S.IC.B.3 TOP: Analysis of Data

69 ANS: 2

$$u = x - 2 \quad u^2 + 27u - 90$$

$$(u + 30)(u - 3)$$

$$(x - 2 + 30)(x - 2 - 3)$$

$$(x + 28)(x - 5)$$

REF: 012503aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

70 ANS: 2

$$.962^{10} \approx .679$$

REF: 082311aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

71 ANS: 3

$$x = \frac{1}{2}y + 2$$

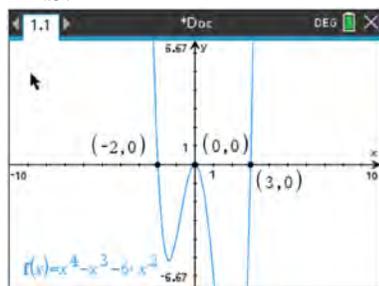
$$2x = y + 4$$

$$y = 2x - 4$$

REF: 012315aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

72 ANS: 2



REF: 012316aai NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

73 ANS: 2

$$f(x) = f(-x)$$

$$x^2 + 1 = (-x)^2 + 1$$

$$x^2 + 1 = x^2 + 1$$

REF: 082323aai NAT: F.BF.B.3 TOP: Even and Odd Functions

74 ANS: 2

$$2x^4 - x^3 - 16x + 8 = 0$$

$$x^3(2x - 1) - 8(2x - 1) = 0$$

$$(x^3 - 8)(2x - 1) = 0$$

$$x = 2, \frac{1}{2}$$

REF: 012307aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

75 ANS: 2 REF: 082203aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: amplitude

76 ANS: 4

$$\frac{x(x-4)}{(x+3)(x-4)} + \frac{2(x+3)}{(x-4)(x+3)} = \frac{2x+27}{(x-4)(x+3)} \quad -3 \text{ is extraneous.}$$

$$x^2 - 4x + 2x + 6 = 2x + 27$$

$$x^2 - 2x + 6 = 2x + 27$$

$$x^2 - 4x - 21 = 0$$

$$(x-7)(x+3) = 0$$

$$x = 7, -3$$

REF: 082405aai NAT: A.REI.A.2 TOP: Solving Rationals

77 ANS: 2

$$i^2(5x-2i)^2 = -(25x^2 - 20xi - 4)$$

REF: 012512aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

78 ANS: 4

$$\log 2^t = \log \sqrt{10} \quad 2) \frac{\log \sqrt{10}}{\log 2} = \log_2 \sqrt{10}, \quad 1) \log_2 \sqrt{10} = \log_2 10^{\frac{1}{2}} = \frac{1}{2} \log_2 10, \quad 3) \log_4 10 = \frac{\log_2 10}{\log_2 4} = \frac{1}{2} \log_2 10$$

$$t \log 2 = \log \sqrt{10}$$

$$t = \frac{\log \sqrt{10}}{\log 2}$$

REF: 012009aai NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

79 ANS: 2

$$x^2 = 3x + 40. \quad x = -5 \text{ is an extraneous solution.}$$

$$x^2 - 3x - 40 = 0$$

$$(x-8)(x+5) = 0$$

$$x = 8, -5$$

REF: 012010aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

80 ANS: 4 REF: 012501aai NAT: F.TF.A.2 TOP: Determining Trigonometric Functions

KEY: radians

81 ANS: 3 REF: 012005aai NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

82 ANS: 3

$$M = \frac{240000 \left( \frac{4.5\%}{12} \right) \left( 1 + \frac{4.5\%}{12} \right)^{15 \times 12}}{\left( 1 + \frac{4.5\%}{12} \right)^{15 \times 12} - 1} \approx 1835.98$$

REF: 062209aai NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

83 ANS: 4 REF: 012014aai NAT: S.IC.B.5 TOP: Analysis of Data

84 ANS: 3

$$10^{5x-2} = 3$$

$$\log 10^{5x-2} = \log 3$$

$$(5x-2) \log 10 = \log 3$$

$$5x-2 = \log 3$$

$$5x = \log 3 + 2$$

$$x = \frac{\log 3 + 2}{5}$$

REF: 012517aai NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

85 ANS: 3 REF: 062205aai NAT: F.BF.B.3 TOP: Transformations with Functions

86 ANS: 2

The mass of the carbon-14 is decreasing by half every 5715 years.

REF: 062211aai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

87 ANS: 4

$$g(x): \frac{10-6}{4-2} = 2 \quad t(x): \frac{3--5}{4-2} = 4$$

REF: 062212aai NAT: F.IF.B.6 TOP: Rate of Change

KEY: graph | table

88 ANS: 3

$$3 \mid 1 \ 1 \ -3 \ 9 \ -108 \quad x^3 + 4x^2 + 9x + 36 = 0$$

$$\mid \underline{3 \ 12 \ 27 \ 108} \quad x^2(x+4) + 9(x+4) = 0$$

$$1 \ 4 \ 9 \ 36 \quad 0 \quad (x^2 + 9)(x+4) = 0$$

$$x = \pm 3i, -4$$

REF: 062420aai NAT: A.APR.D.6 TOP: Solving Polynomial Equations

89 ANS: 1

$$\frac{4x^2 - 5}{x^2 - 1} = \frac{4(x^2 - 1)}{x^2 - 1} - \frac{1}{x^2 - 1}$$

REF: 012510aii NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

90 ANS: 3

$$(x^2 - 49) \left( \frac{7}{x+7} + \frac{4x}{x-7} = \frac{3x+7}{x-7} \right)$$

$$7(x-7) + 4x(x+7) = (3x+7)(x+7)$$

$$7x - 49 + 4x^2 + 28x = 3x^2 + 21x + 7x + 49$$

$$4x^2 + 35x - 49 = 3x^2 + 28x + 49$$

$$x^2 + 7x - 98 = 0$$

$$(x+14)(x-7) = 0$$

$$x = -14, 7$$

REF: 012422aii NAT: A.REI.A.2 TOP: Solving Rationals

91 ANS: 2

REF: 012321aii

NAT: F.BF.A.2

TOP: Sequences

KEY: recursive

92 ANS: 3

REF: 012418aii

NAT: S.IC.B.6

TOP: Analysis of Data

KEY: draw conclusions

93 ANS: 1

$$x+2 \overline{) \begin{array}{r} x^3 - 2x^2 - x + 6 \\ x^4 + 0x^3 - 5x^2 + 4x + 14 \end{array}}$$

$$\underline{x^4 + 2x^3}$$

$$-2x^3 - 5x^2$$

$$\underline{-2x^3 - 4x^2}$$

$$-x^2 + 4x$$

$$\underline{-x^2 - 2x}$$

$$6x + 14$$

$$\underline{6x + 12}$$

$$2$$

REF: 012305aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

94 ANS: 2

$$\sqrt{4-x} = x+8 \qquad -12+8 = -4$$

$$4-x = x^2 + 16x + 64$$

$$0 = x^2 + 17x + 60$$

$$x = (x+12)(x-5) + x = -12, 5$$

REF: 012521aii NAT: A.REI.A.2 TOP: Solving Radicals

95 ANS: 3

$$\sin^2 A + \left( \frac{\sqrt{5}}{3} \right)^2 = 1 \quad \text{Since } \tan A < 0, \sin A = -\frac{2}{3}$$

$$\sin^2 A + \frac{5}{9} = \frac{9}{9}$$

$$\sin^2 A = \frac{4}{9}$$

$$\sin A = \pm \frac{2}{3}$$

REF: 012320aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

96 ANS: 2 REF: 082409aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

97 ANS: 3

$$y = 40(1.2)^8 \approx 168$$

REF: 062406aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

98 ANS: 1

$$\frac{20}{14+20+6} = \frac{1}{2}$$

REF: 082303aii NAT: S.CP.A.4 TOP: Conditional Probability

99 ANS: 1

$$50(1.19^{\frac{1}{12}})^{12t} \approx 50(1.015)^{12t}$$

REF: 012424aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

100 ANS: 2

$$y = x^3 - 3$$

$$x = y^3 - 3$$

$$x + 3 = y^3$$

$$\sqrt[3]{x + 3} = y$$

REF: 012419aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: cubic

101 ANS: 2

$$\sqrt{(-2)^2 + (-3)^2} = \sqrt{13}; \tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\frac{-3}{\sqrt{13}}}{\frac{-2}{\sqrt{13}}} = \frac{3}{2}$$

REF: 062304aai NAT: F.TF.A.2 TOP: Determining Trigonometric Functions

KEY: extension to reals

102 ANS: 2

$$\begin{aligned} u = x + 3 \quad u^2 + 4u - 5 \\ (u + 5)(u - 1) \\ (x + 3 + 5)(x + 3 - 1) \\ (x + 8)(x + 2) \end{aligned}$$

REF: 062401aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

103 ANS: 3

$$\frac{-2}{\sqrt{5^2 - 2^2}} = \frac{-2}{\sqrt{21}}$$

REF: 082312aai NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

104 ANS: 2

$$\frac{x^2 + 12}{x^2 + 3} = \frac{x^2 + 3}{x^2 + 3} + \frac{9}{x^2 + 3} = 1 + \frac{9}{x^2 + 3}$$

REF: 062218aai NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

105 ANS: 1

$$\frac{x(x^2 - 9)}{-(x^2 - 9)} = -x$$

REF: 012023aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

106 ANS: 1

The vertical distance from the directrix to the vertex,  $p$ , is 2. The vertical distance from the vertex to the focus must also be 2.

REF: 062213aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

107 ANS: 4

$$49 \times 16.7\% \approx 8$$

REF: 062418aii NAT: S.ID.A.4 TOP: Normal Distributions

KEY: predict

108 ANS: 4

$$A(t) = 150\left((1.02)^{\frac{1}{7}}\right)^{7t} \approx 150(1.00283)^{7t}$$

REF: 062415aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

109 ANS: 3

$$\sqrt{3x+18} = x \quad -3 \text{ is extraneous.}$$

$$3x+18 = x^2$$

$$x^2 - 3x - 18 = 0$$

$$(x-6)(x+3) = 0$$

$$x = 6, -3$$

REF: 082315aii NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

110 ANS: 2

$$\begin{array}{r} \phantom{x+3} \overline{2x^2 - 3x + 5} \\ x+3 \overline{) 2x^3 + 3x^2 - 4x + 5} \\ \underline{2x^3 + 6x^2} \phantom{+ 5} \\ -3x^2 - 4x \phantom{+ 5} \\ \underline{-3x^2 - 9x} \phantom{+ 5} \\ 5x + 5 \\ \underline{5x + 15} \\ -10 \end{array}$$

REF: 082302aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

111 ANS: 4

REF: 012314aii NAT: S.IC.B.3 TOP: Analysis of Data

112 ANS: 3

$$y = -6x + \frac{1}{2}$$

$$x = -6y + \frac{1}{2}$$

$$x - \frac{1}{2} = -6y$$

$$-\frac{1}{6} \left( x - \frac{1}{2} \right) = y$$

REF: 062217aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

113 ANS: 4

$$y = \sqrt[3]{x+2}$$

$$x = \sqrt[3]{y+2}$$

$$x^3 = y + 2$$

$$y = x^3 - 2$$

REF: 062419aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: cubic

114 ANS: 2

$$y = \sqrt[3]{x} + 4$$

$$x = \sqrt[3]{y} + 4$$

$$x - 4 = \sqrt[3]{y}$$

$$(x - 4)^3 = y$$

REF: 012519aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: cubic

115 ANS: 4 REF: 082301aai NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

116 ANS: 1

$$x^2 - 4x + 4 = -13 + 4$$

$$(x - 2)^2 = -9$$

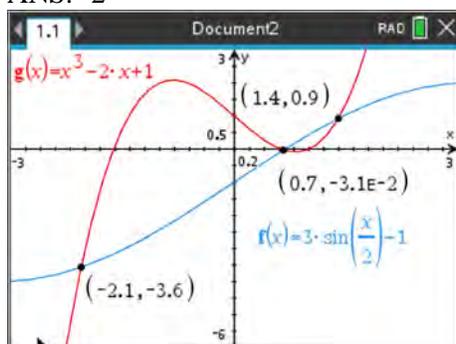
$$x - 2 = \pm 3i$$

$$x = 2 \pm 3i$$

REF: 062312aai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | completing the square

117 ANS: 2



REF: 012021aai NAT: A.REI.D.11 TOP: Other Systems  
KEY: trigonometric

118 ANS: 1

$$P = \frac{2\pi}{\frac{2\pi}{3}} = 3$$

REF: 082413aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions  
KEY: period

119 ANS: 3

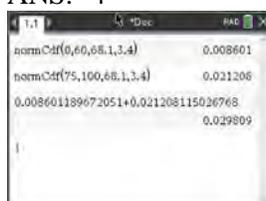
$$x = 12y - 4$$

$$x + 4 = 12y$$

$$\frac{x+4}{12} = y$$

REF: 082304aai NAT: F.BF.B.4 TOP: Inverse of Functions  
KEY: linear

120 ANS: 4



REF: 062316aai NAT: S.ID.A.4 TOP: Normal Distributions  
KEY: percent

121 ANS: 4

$$(x - 2i)(x - 2i) = x^2 - 4xi + 4i^2 = x^2 - 4xi - 4$$

REF: 082202aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

122 ANS: 4 REF: 062411aai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

123 ANS: 3

$$\frac{4}{k^2 - 8k + 12} = \frac{k(k-6) + (k-2)}{k^2 - 8k + 12} \quad k = 6 \text{ is extraneous}$$

$$4 = k^2 - 6k + k - 2$$

$$0 = k^2 - 5k - 6$$

$$0 = (k-6)(k+1)$$

$$k = 6, -1$$

REF: 082218aai NAT: A.REI.A.2 TOP: Solving Rationals

124 ANS: 4

$$S_{10} = \frac{90000 - 90000(1.02)^{10}}{1 - 1.02} \approx 985,475$$

REF: 082424aai NAT: F.BF.B.7 TOP: Series KEY: geometric

125 ANS: 1

$$1.0325^{\frac{1}{12}} \approx 1.0027$$

REF: 012323aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

126 ANS: 3

$$95.4x - 6x^2 - (0.18x^3 + 0.02x^2 + 4x + 180)$$

REF: 082322aai NAT: F.BF.A.1 TOP: Operations with Functions

127 ANS: 3

$$a = 105, 0 < b < 1$$

REF: 082314aai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

128 ANS: 3

$$3i(ai - 6i^2) = 3ai^2 - 18i^3 = -3a + 18i$$

REF: 062307aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

129 ANS: 2

$$\left(\frac{1}{x^{-2}}\right)^{-\frac{3}{4}} = \frac{1}{x^{\frac{3}{2}}} = \frac{1}{x^{\frac{2}{2}} \cdot x^{\frac{1}{2}}} = \frac{1}{x\sqrt{x}}$$

REF: 082412aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

130 ANS: 3

$$x^2 + 6x + 9 = -10 + 9$$

$$(x + 3)^2 = -1$$

$$x + 3 = \pm i$$

$$x = -3 \pm i$$

REF: 012416aai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | completing the square

131 ANS: 2

Since the distance from the focus to the directrix is 2,  $p = 1$  and the vertex of the parabola is (0,5).

$$y = \frac{1}{4p}(x - h)^2 + k$$

$$y = \frac{1}{4(1)}(x - 0)^2 + 5$$

$$y = \frac{1}{4}x^2 + 5$$

$$y - 5 = \frac{1}{4}x^2$$

$$4(y - 5) = x^2$$

REF: 062323aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

132 ANS: 3 REF: 012401aai NAT: S.IC.B.3 TOP: Analysis of Data

133 ANS: 3

$$p(x) = r(x) - c(x)$$

$$-15x^2 + 600x + 60 = -0.4x^2 + 130x + 1200 - c(x)$$

$$c(x) = 14.6x^2 - 470x + 1140$$

REF: 062421aai NAT: F.BF.A.1 TOP: Operations with Functions

134 ANS: 1

$$\left(a^3\sqrt{2b^2}\right)\left(\sqrt[3]{4a^2b}\right) = a^3\sqrt{8a^2b^3} = 2ab^3\sqrt{a^2}$$

REF: 082213aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

135 ANS: 4 REF: 082220aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

136 ANS: 4

$$45\% + 31\% - 58\% = 18\%$$

REF: 082307aai NAT: S.CP.B.7 TOP: Addition Rule

137 ANS: 4

I. Minimum does not change, only period; II.  $-16 + 8 = -8$ ; III.  $\frac{1}{2}(-16) = -8$ 

REF: 012523aia NAT: F.BF.B.3 TOP: Transformations with Functions

138 ANS: 1

1)  $A(20) > 0$ ; 2)  $.5 \times .5 = .25$ ; 3) true; 4)  $A(7) \approx 9.9$ 

REF: 082211aia NAT: F.LE.B.5 TOP: Modeling Exponential Functions

139 ANS: 4

1)  $-1$  is also a zero. 2)  $x^2(x-a) + 16(x-a) = (x^2 + 16)(x-a)$   $a$  is the only zero. 3)  $-a$  is the only zero. 4)  $x^2(x-a) - 9(x-a) = (x^2 - 9)(x-a)$ .

REF: 012019aia NAT: A.APR.B.3 TOP: Solving Polynomial Equations

140 ANS: 4

$$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$

REF: 012417aia NAT: A.APR.C.4 TOP: Polynomial Identities

141 ANS: 2

.43  $\pm$  2(0.05) contains about 95% of the data.

REF: 062317aia NAT: S.IC.B.4 TOP: Analysis of Data

142 ANS: 2

1) 1 real, mult. 2; 3) not a quadratic; 4) not a function.

REF: 012324aia NAT: A.REI.B.4 TOP: Using the Discriminant

KEY: determine nature of roots

143 ANS: 1

$$\begin{array}{r} 2x^2 + 3x + 4 \\ x-3 \overline{) 2x^3 - 3x^2 - 5x - 12} \\ \underline{2x^3 - 6x^2} \phantom{- 12} \\ 3x^2 - 5x \phantom{- 12} \\ \underline{3x^2 - 9x} \phantom{- 12} \\ 4x - 12 \\ \underline{4x - 12} \\ 0 \end{array}$$

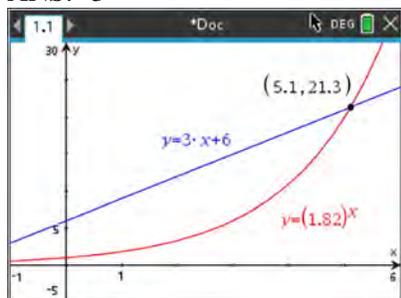
REF: 012505aia NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

144 ANS: 3

REF: 082401aia NAT: S.IC.B.3 TOP: Analysis of Data

145 ANS: 3



REF: 012406aii NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

146 ANS: 2

$$(x^2 + 3)^2 - 2(x^2 + 3) - 24 \text{ let } u = x^2 + 3$$

$$u^2 - 2u - 24$$

$$(u - 6)(u + 4)$$

$$(x^2 + 3 - 6)(x^2 + 3 + 4)$$

REF: 062310aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

147 ANS: 2

$$2x + 4y - 2z = 2 \quad -x - 3y + 2z = 0 \quad x + y = 2 \quad 3 + 2y - z = 1 \quad 2y - z = -2$$

$$-x - 3y + 2z = 0 \quad 4x - 8y + 2z = 20 \quad x - y = 4 \quad 6 - 4y + z = 10 \quad 2(-1) - z = -2$$

$$x + y = 2 \quad 5x - 5y = 20 \quad 2x = 6 \quad 2y - z = -2 \quad z = 0$$

$$x - y = 4 \quad x = 3 \quad -4y + z = 4$$

$$-2y = 2$$

$$y = -1$$

REF: 062208aii NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

148 ANS: 2

$$2^x - 4 > 0$$

$$2^x > 4$$

$$x > 2$$

REF: 082402aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

149 ANS: 1

$$x + y + z = 9 \quad 4 - y - z = -1 \quad 4 - 6 + z = 9$$

$$\underline{x - y - z = -1} \quad 4 - y + z = 21 \quad z = 11$$

$$2x = 8 \quad -y - z = -5$$

$$x = 4 \quad \underline{-y + z = 17}$$

$$-2y = 12$$

$$y = -6$$

REF: 012018aai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

150 ANS: 3

between 000 and 449, inclusive  $\rightarrow \frac{450}{1000} = 45\%$

REF: 012024aai NAT: S.IC.B.3 TOP: Analysis of Data

151 ANS: 1

$$(2x - 3)^2 = 4x^2 - 12x + 9 \quad (x - 2)^3 = (x - 2)(x - 2)^2 = (x - 2)(x^2 - 4x + 4)$$

$$s = 4$$

$$s = -4 \text{ and } 4$$

REF: 062405aai NAT: A.APR.C.4 TOP: Polynomial Identities

152 ANS: 1

$$7 - 3i + x^2 - 4xi + 4i^2 - 4i - 2x^2 = 7 - 7i - x^2 - 4xi - 4 = 3 - x^2 - 4xi - 7i = (3 - x^2) - (4x + 7)i$$

REF: 012022aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

153 ANS: 2 REF: 082313aai NAT: S.ID.A.4 TOP: Normal Distributions

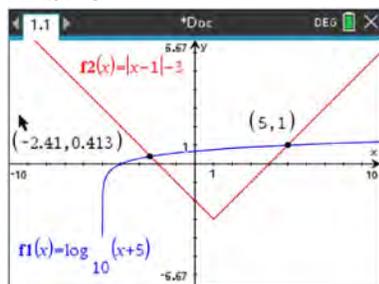
KEY: percent

154 ANS: 4

$$S_5 = \frac{350 - 350(1.15)^5}{1 - 1.15} \approx 2360$$

REF: 012524aai NAT: F.BF.B.7 TOP: Series KEY: geometric

155 ANS: 3



REF: 012317aai NAT: A.REI.D.11 TOP: Other Systems

KEY: logarithmic

156 ANS: 2

$$-23(1) + 56 = 33; \quad -23(-1) + 56 = 79$$

REF: 062305aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

157 ANS: 4

$$\frac{15000}{12000} = \frac{12000e^{.025t}}{12000}$$

$$1.25 = e^{.025t}$$

$$\ln 1.25 = \ln e^{.025t}$$

$$\ln 1.25 = .025t$$

$$\frac{\ln 1.25}{.025} = t$$

REF: 082209aai NAT: F.LE.A.4 TOP: Exponential Growth

158 ANS: 1

$$2) (x^4 - x^2y^2 + y^4) \neq (x^2 - y^2)(x^2 - y^2); \quad 3) x^6 + y^6 \neq (x^3 + y^3)^2; \quad 4) \frac{x^6 + y^6}{x^2 + y^2} \neq x^6 + y^6 - (x^2 + y^2)$$

REF: 082219aai NAT: A.APR.C.4 TOP: Polynomial Identities

159 ANS: 2

$$2x^3 + x^2 - 18x - 9$$

$$x^2(2x + 1) - 9(2x + 1)$$

$$(x^2 - 9)(2x + 1)$$

$$(x + 3)(x - 3)(2x + 1)$$

REF: 082206aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

160 ANS: 1

$$x + 3 \overline{) \begin{array}{r} 2x^2 + x - 6 \\ 2x^3 + 7x^2 - 3x - 25 \end{array}}$$

$$\underline{2x^3 + 6x^2}$$

$$x^2 - 3x$$

$$\underline{x^2 + 3x}$$

$$-6x - 25$$

$$\underline{-6x - 18}$$

$$-7$$

REF: 062203aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

161 ANS: 1

$$2xy^2\sqrt[3]{x^2y} = 2x^{\frac{3}{3}}y^{\frac{6}{3}}x^{\frac{2}{3}}y^{\frac{1}{3}} = 2x^{\frac{5}{3}}y^{\frac{7}{3}}$$

REF: 062413aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

162 ANS: 2

$$1) x^4 - 2x^2y^2 + y^4 + 4x^2y^2; 3) x^4 + 2x^2y^2 + y^4; 4) 4x^4 + 4x^2y^2 + y^4 - 3x^4 - 2x^2y^2$$

REF: 012522aai NAT: A.APR.C.4 TOP: Polynomial Identities

163 ANS: 1

$$\text{If } \sin \theta = \frac{7}{25}, \cos \theta = -\frac{24}{25} \text{ in QII, and } \tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\frac{7}{25}}{-\frac{24}{25}} = -\frac{7}{24}$$

REF: 062417aai NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

164 ANS: 4

$$\text{I. } \left(\frac{y}{x^3}\right)^{-1} = \frac{x^3}{y}; \text{ II. } \sqrt[3]{x^9}(y^{-1}) = \frac{x^{\frac{9}{3}}}{y} = \frac{x^3}{y}; \text{ III. } \frac{x^{64}\sqrt{y^8}}{x^3y^3} = \frac{x^3y^{\frac{8}{4}}}{y^3} = \frac{x^3}{y}$$

REF: 062320aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

165 ANS: 1

$$0.5^{\frac{1}{0.0803}} \approx 0.000178$$

REF: 082224aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

166 ANS: 1 REF: 082221aai NAT: F.BF.B.6 TOP: Sigma Notation

KEY: represent

167 ANS: 3

$$(6 - ki)^2 = 27 - 36i$$

$$36 - 12ki + k^2i^2 = 27 - 36i$$

$$9 - k^2 - 12ki = -36i$$

Set real part equal to real part:  $9 - k^2 = 0$  Set imaginary part equal to imaginary part:  $-12ki = -36i$ 

$$k = \pm 3$$

$$\frac{-12ki}{-12i} = \frac{-36i}{-12i}$$

$$k = 3$$

REF: 012308aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

168 ANS: 3 REF: 062409aai NAT: A.REI.B.4 TOP: Using the Discriminant

KEY: determine nature of roots

169 ANS: 4

$$\begin{array}{r}
 6x^3 - 8x^2 + 16x - 31 \\
 x + 2 \overline{) 6x^4 + 4x^3 + 0x^2 + x + 200} \\
 \underline{6x^4 + 12x^3} \phantom{+ 0x^2 + x + 200} \\
 -8x^3 + 0x^2 \phantom{+ x + 200} \\
 \underline{-8x^3 - 16x^2} \phantom{+ x + 200} \\
 16x^2 + x \phantom{+ 200} \\
 \underline{16x^2 + 32x} \phantom{+ 200} \\
 -31x + 200 \\
 \underline{-31x - 62} \\
 262
 \end{array}$$

REF: 082407aii NAT: A.APR.D.6 TOP: Rational Expressions  
 KEY: division

170 ANS: 4

Since the terminal side of  $\theta$  passes through  $(-3, -4)$ ,  $\cos \theta < 0$  and  $\sin \theta < 0$ .  $\cos \theta < 0 \rightarrow \sec \theta < 0$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \rightarrow \frac{-}{-} = +$$

REF: 082420aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions  
 KEY: extension to reals

171 ANS: 4

$$5i(2x + 3i) - x\sqrt{-9} = 10xi + 15i^2 - 3xi = -15 + 7xi$$

REF: 082415aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

172 ANS: 1

$$\frac{8+12}{120} \bullet \frac{8+40}{120} = \frac{8}{120}$$

$$\frac{1}{6} \bullet \frac{4}{10} = \frac{1}{15}$$

$$\frac{4}{60} = \frac{1}{15}$$

REF: 082422aii NAT: S.CP.A.4 TOP: Conditional Probability

173 ANS: 4 REF: 012016aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions  
 KEY: increasing/decreasing

174 ANS: 2 REF: 082308aii NAT: A.REI.B.4 TOP: Using the Discriminant  
 KEY: determine nature of roots

175 ANS: 2  
 $40 - (20 + 22 - 15) = 13$

REF: 062204aai NAT: S.CP.B.7 TOP: Addition Rule

176 ANS: 1  
 $8^{\frac{x}{2}} \cdot 8^{\frac{x}{3}} = 8^{\frac{5x}{6}} = \sqrt[6]{8^{5x}}$

REF: 082419aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

177 ANS: 4 REF: 062412aai NAT: F.BF.A.2 TOP: Sequences  
 KEY: recursive

178 ANS: 3 REF: 012003aai NAT: A.APR.C.4 TOP: Polynomial Identities

179 ANS: 4 REF: 082205aai NAT: F.TF.A.2 TOP: Unit Circle

180 ANS: 2  
 $a^{\frac{5}{5}} \sqrt[5]{a^4} = a^{\frac{5}{5}} \cdot a^{\frac{4}{5}} = a^{\frac{9}{5}}$

REF: 062306aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

181 ANS: 4  
 $\frac{1}{2}x^2 + 2x = \frac{1}{4}x - 8 \quad b^2 - 4ac$   
 $2x^2 + 8x = x - 32 \quad 7^2 - 4(2)(32) < 0$   
 $2x^2 + 7x + 32 = 0$

REF: 012310aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

182 ANS: 4  
 $\frac{x^2 + 6}{x^2 + 4} = \frac{x^2 + 4}{x^2 + 4} + \frac{2}{x^2 + 4} = 1 + \frac{2}{x^2 + 4}$

REF: 082321aai NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

183 ANS: 2 REF: 062206aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

184 ANS: 3



$\bar{x} + 2\sigma$  represents approximately 99.1% of the data.

REF: 012514aai NAT: S.ID.A.4 TOP: Normal Distributions  
 KEY: percent

185 ANS: 2

$$1) \frac{29860 - 629}{1910 - 1850} \approx 487; 2) \frac{790390 - 494290}{2010 - 1990} \approx 14805; 3) \frac{251808 - 132459}{1970 - 1950} \approx 5967; 4) \frac{251808 - 14575}{1970 - 1890} \approx 2965$$

REF: 062301aai NAT: F.IF.B.6 TOP: Rate of Change

KEY: table

186 ANS: 1

$$2000 \left( 1 + \frac{.032}{12} \right)^{12t} \approx 2000(1.003)^{12t}$$

REF: 012004aai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

187 ANS: 1

In vertex form, the parabola is  $y = \frac{1}{4(2)}(x+5)^2 - 2$ . The vertex is  $(-5, -2)$  and  $p = 2$ .  $2 + -2 = 0$

REF: 082416aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

188 ANS: 1

$$\frac{N(6) - N(0)}{6 - 0} \approx -8.93$$

REF: 012012aai NAT: F.IF.B.6 TOP: Rate of Change

KEY: exponential

189 ANS: 4 REF: 062216aai NAT: S.IC.B.3 TOP: Analysis of Data

190 ANS: 4

$$f(0) = 4 \sin(2(0)) = 0; g(0) = 3(0)^4 + 2(0)^3 + 7 = 7; h(0) = 5e^{2(0)} + 3 = 8; j(0) = 6 \log_2(3(0) + 4) = 12$$

REF: 082310aai NAT: F.IF.C.9 TOP: Comparing Functions

191 ANS: 2 REF: 012311aai NAT: A.APR.C.4 TOP: Polynomial Identities

192 ANS: 4

The distance between the focus and directrix is  $1 - -3 = 4$ .  $p$  is half this distance, or 2. The vertex of the parabola is  $(4, -1)$ . Since the directrix is above the focus, the parabola faces downward.  $y = -\frac{1}{4p}(x-h)^2 + k$

$$y = -\frac{1}{4(2)}(x-4)^2 - 1$$

$$y + 1 = -\frac{1}{8}(x-4)^2$$

REF: 012322aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

193 ANS: 4

$$6(2^{x+4}) = 36$$

$$\ln 2^{x+4} = \ln 6$$

$$(x+4)\ln 2 = \ln 6$$

$$x+4 = \frac{\ln 6}{\ln 2}$$

$$x = \frac{\ln 6}{\ln 2} - 4$$

REF: 082408aai NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

194 ANS: 1

$$\log 3^{x+4} = \log 28$$

$$\frac{(x+4)\log 3}{\log 3} = \frac{\log 28}{\log 3}$$

$$x+4 = \frac{\log 28}{\log 3}$$

$$x = \log_3 28 - 4$$

REF: 082306aai NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

195 ANS: 4

REF: 062309aai

NAT: F.IF.C.9

TOP: Comparing Functions

196 ANS: 1

REF: 012502aai

NAT: S.IC.B.3

TOP: Analysis of Data

197 ANS: 1

$$\frac{f(x)}{g(x)} = \frac{2x^2 + 7x - 15}{3 - 2x} = \frac{(2x-3)(x+5)}{-(2x-3)} = \frac{x+5}{-1} = -x-5$$

REF: 012412aai NAT: F.BF.A.1 TOP: Operations with Functions

198 ANS: 4

1) is a correct formula, but not recursive

REF: 082216aai NAT: F.BF.A.2 TOP: Sequences KEY: recursive

199 ANS: 3

3|-2-11-12 9 x-3 is not a factor since there is a remainder. -2|-2-11-12 9

$$\begin{array}{r} | \quad -6 \quad -51 \quad -189 \\ \hline \end{array}$$

$$-2 \quad -17 \quad -63 \quad -180$$

$$\begin{array}{r} | \quad \quad \quad 4 \quad 14 \quad -4 \\ \hline \end{array}$$

$$-2 \quad -7 \quad 2 \quad 5$$

REF: 062414aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

200 ANS: 3

REF: 082214aai

NAT: F.IF.C.7

TOP: Graphing Exponential Functions

201 ANS: 4

REF: 012008aai

NAT: S.CP.A.3

TOP: Conditional Probability

202 ANS: 1

$$\frac{(x+3)(x+2)}{(x-5)(x+2)} + \frac{6(x-5)}{(x+2)(x-5)} = \frac{6+10x}{(x-5)(x+2)} \quad 5 \text{ is extraneous.}$$

$$x^2 + 5x + 6 + 6x - 30 = 10x + 6$$

$$x^2 + x - 30 = 0$$

$$(x+6)(x-5) = 0$$

$$x = -6, 5$$

REF: 062319aai NAT: A.REI.A.2 TOP: Solving Rationals

203 ANS: 3 REF: 012404aai NAT: F.LE.A.4 TOP: Express Exponentials as Logarithms

204 ANS: 2

$$\begin{array}{r} x^2 + 2x + 4 \\ x-2 \overline{) x^3 - 0x^2 + 0x - 2} \\ \underline{x^3 - 2x^2} \phantom{- 2} \\ 2x^2 + 0x \phantom{- 2} \\ \underline{2x^2 - 4x} \phantom{- 2} \\ 4x - 2 \\ \underline{4x - 8} \\ 6 \end{array}$$

REF: 082217aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

205 ANS: 4

$$x^3 - x^2yi - xy^2 + x^2yi - xy^2i^2 - y^3i = x^3 - xy^2 - xy^2(-1) - y^3i = x^3 - y^3i$$

REF: 062223aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

206 ANS: 2

$$x+1 = \sqrt{4x+25} \quad -4+1 < 0$$

$$x^2 + 2x + 1 = 4x + 25$$

$$x^2 - 2x - 24 = 0$$

$$(x-6)(x+4) = 0$$

$$x = 6, -4$$

REF: 062408aai NAT: A.REI.A.2 TOP: Solving Radicals

207 ANS: 1

$$x^4 + x$$

$$x(x^3 + 1)$$

$$x(x+1)(x^2 - x + 1)$$

$$(x+1)(x^3 - x^2 + x)$$

REF: 082404aai NAT: A.APR.C.4 TOP: Polynomial Identities

208 ANS: 4

REF: 012423aai NAT: F.BF.B.7 TOP: Series

KEY: geometric

209 ANS: 1

$$u = x + 2 \quad u^2 - 5u + 6$$

$$(u - 3)(u - 2)$$

$$(x + 2 - 3)(x + 2 - 2)$$

$$(x - 1)x$$

REF: 012301aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: higher power

210 ANS: 2

$$3x^2 - 7x + 25 - (7x^2 - 10x + 22) = -4x^2 + 3x + 3$$

REF: 012513aai NAT: F.BF.A.1 TOP: Operations with Functions

211 ANS: 2

1)  $x \rightarrow \infty, f(x) \rightarrow \infty$ ; 3) quartic polynomial; 4) three real roots

REF: 012318aai NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

212 ANS: 2

$$a_2 = 8 + \log_{2+1} 1 = 8 + 0 = 8$$

$$a_3 = 8 + \log_{3+1} 2 = 8 + \frac{1}{2} = 8.5$$

REF: 062221aai NAT: F.IF.A.3 TOP: Sequences KEY: recursive

213 ANS: 4

Translate the parent log function 2 to the right and reflect over the  $x$ -axis.

REF: 082207aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

214 ANS: 2

$$\begin{array}{r}
 2x^3 + 6x^2 + 13x + 42 \\
 x - 3 \overline{) 2x^4 + 0x^3 - 5x^2 + 3x - 2} \\
 \underline{2x^4 - 6x^3} \phantom{+ 19x^2 + 3x - 2} \\
 6x^3 - 5x^2 \phantom{+ 3x - 2} \\
 \underline{6x^3 - 18x^2} \phantom{+ 3x - 2} \\
 13x^2 + 3x - 2 \\
 \underline{13x^2 - 39x} \phantom{- 2} \\
 42x - 2 \\
 \underline{42x - 126} \\
 124
 \end{array}$$

REF: 012408aai NAT: A.APR.D.6 TOP: Rational Expressions  
 KEY: division

215 ANS: 3

$$P = 210x^{\frac{4}{3}}y^{\frac{7}{3}} = 210x^{\frac{3}{3}}x^{\frac{1}{3}}y^{\frac{6}{3}}y^{\frac{1}{3}} = 210x \cdot x^{\frac{1}{3}}y^2y^{\frac{1}{3}} = 210xy^2\sqrt[3]{xy}$$

REF: 012413aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

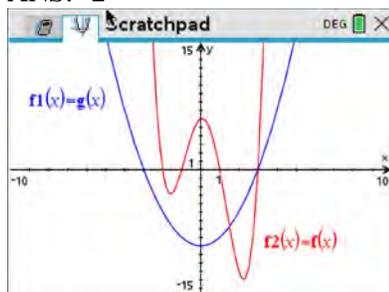
216 ANS: 1 REF: 062201aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

217 ANS: 4

$$S_{15} = \frac{10 - 10(1.09)^{15}}{1 - 1.09} \approx 293.609$$

REF: 062424aai NAT: F.BF.B.7 TOP: Series KEY: geometric

218 ANS: 2



REF: 082319aai NAT: A.REI.D.11 TOP: Other Systems  
 KEY: polynomial

219 ANS: 2

$$3x^2 - 4x + 2 = 2x - 3 \quad x = \frac{6 \pm \sqrt{(-6)^2 - 4(3)(5)}}{2(3)} = \frac{6 \pm \sqrt{-24}}{6} = \frac{6 \pm 2i\sqrt{6}}{6} = 1 \pm \frac{i\sqrt{6}}{3}$$

$$3x^2 - 6x + 5 = 0$$

REF: 062410aii NAT: A.REI.B.4 TOP: Solving Quadratics

220 ANS: 1

$$50(.9)^t = 25$$

$$t \approx 6.57$$

REF: 082317aii NAT: F.LE.A.4 TOP: Exponential Decay

221 ANS: 3 REF: 012002aii NAT: F.BF.A.1 TOP: Operations with Functions

222 ANS: 3

$$\frac{x+2}{x} + \frac{x}{3} = \frac{2x^2+6}{3x} \quad 0 \text{ is extraneous.}$$

$$\frac{x^2+3x+6}{3x} = \frac{2x^2+6}{3x}$$

$$x^2+3x+6 = 2x^2+6$$

$$x^2-3x = 0$$

$$x(x-3) = 0$$

$$x = 0, 3$$

REF: 012309aii NAT: A.REI.A.2 TOP: Solving Rationals

223 ANS: 1

$$\frac{2\pi}{b} = 12$$

$$12b = 2\pi$$

$$b = \frac{\pi}{6}$$

REF: 012520aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: period

224 ANS: 4 REF: 082318aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

225 ANS: 3

$$\frac{12(y+1)}{12} = \frac{(x-4)^2}{12}$$

The vertex is (4, -1) and  $p = 3$ , so the focus is (4, 2).  $y = -1 - 3 = -4$ 

$$y = \frac{1}{4(3)}(x-4)^2 - 1$$

REF: 062423aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

226 ANS: 4 REF: 012303aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

227 ANS: 2

$$1 = \frac{2\pi}{k}$$

$$k = 2\pi$$

REF: 012313aai NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

228 ANS: 4

1)  $d(2) = 2$ ; 2)  $d(1) = 12$ ; 3)  $d(9) \approx 11$ ; 4)  $d(-1) = 2$ 

REF: 062220aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

229 ANS: 3

$$\frac{1}{3} + \frac{1}{7} - \frac{9}{21} = \frac{7}{21} + \frac{3}{21} - \frac{9}{21} = \frac{1}{21}$$

REF: 082410aai NAT: S.CP.B.7 TOP: Addition Rule

230 ANS: 1

$$\begin{array}{r|rrrrr} -2 & 1 & -1 & -11 & 5 & 30 \\ & & -2 & 6 & 10 & -30 \\ \hline & 1 & -3 & -5 & 15 & 0 \end{array}$$

Since there is no remainder when the quartic is divided by  $x + 2$ , this binomial is a factor.

REF: 082320aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

231 ANS: 4

$$P(B) \cdot P(P|B) = P(P \text{ and } B)$$

$$.68 \cdot P(P|B) = .49$$

$$P(P|B) = .72$$

REF: 062416aai NAT: S.CP.A.3 TOP: Conditional Probability

232 ANS: 3

$$(x + a)^2 + 5(x + a) + 4 \text{ let } u = x + a$$

$$u^2 + 5u + 4$$

$$(u + 4)(u + 1)$$

$$(x + a + 4)(x + a + 1)$$

REF: 012006aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: multivariable

233 ANS: 2

$$9.82 \pm 2(1.4)$$

REF: 012411aai NAT: S.IC.B.6 TOP: Analysis of Data

KEY: draw conclusions

234 ANS: 1

The product of the roots equals  $(3+i)(3-i) = 9 - i^2 = 10 = \frac{c}{a}$ . OR

$$(x - (3+i))(x - (3-i)) = 0$$

$$(x - 3 - i)(x - 3 + i) = 0$$

$$((x - 3) - i)((x - 3) + i) = 0$$

$$(x - 3)^2 - i^2 = 0$$

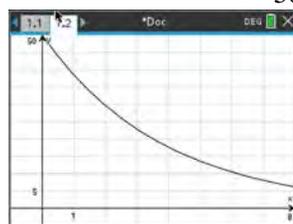
$$x^2 - 6x + 9 + 1 = 0$$

$$x^2 - 6x + 10 = 0$$

REF: 082208aai NAT: A.REI.B.4 TOP: Complex Conjugate Root Theorem

235 ANS: 1

Estimate (0,50) and (1,38) as points on the graph.  $\frac{38}{50} = 76\%$  implies an estimated 24% rate of decay. Confirmed



with graph of  $y = 50(.77)^x$  :

REF: 012516aai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

236 ANS: 1

$$\sqrt[4]{81x^8y^6} = 81^{\frac{1}{4}} x^{\frac{8}{4}} y^{\frac{6}{4}} = 3x^2y^{\frac{3}{2}}$$

REF: 012001aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

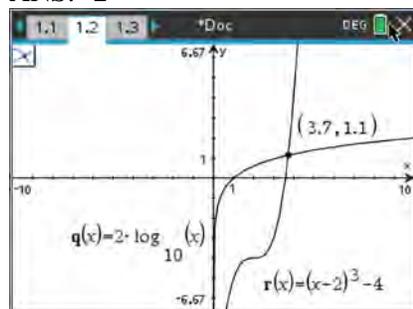
237 ANS: 2

REF: 062219aai

NAT: F.TF.A.1

TOP: Unit Circle

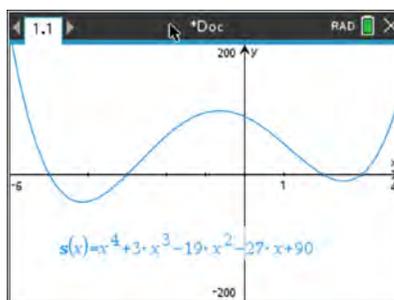
238 ANS: 2



REF: 082417aai NAT: A.REI.D.11 TOP: Other Systems

KEY: logarithmic

239 ANS: 4



$$\begin{aligned}
 s(x) &= x^4 - 9x^2 + 3x^3 - 27x - 10x^2 + 90 \\
 &= x^2(x^2 - 9) + 3x(x^2 - 9) - 10(x^2 - 9) \\
 &= (x^2 + 3x - 10)(x^2 - 9) \\
 &= (x + 5)(x - 2)(x + 3)(x - 3)
 \end{aligned}$$

REF: 062303aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

## Algebra II Multiple Choice Regents Exam Questions Answer Section

240 ANS: 1

$$1240(1.06)^x = 890(1.11)^x$$

$$x \approx 7$$

REF: 061814aai NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

241 ANS: 4

$$1 \text{ year} = 365 \text{ days}$$

REF: 061823aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

242 ANS: 2 REF: 061802aai NAT: F.IF.C.7 TOP: Graphing Exponential Functions

243 ANS: 4

$$\log_2(x - 1) - 1 = 0$$

$$\log_2(x - 1) = 1$$

$$x - 1 = 2^1$$

$$x = 3$$

REF: 061819aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

244 ANS: 1 REF: 081903aai NAT: F.LE.A.2 TOP: Families of Functions

245 ANS: 2 REF: 081911aai NAT: F.BF.B.3 TOP: Even and Odd Functions

246 ANS: 2



REF: 061817aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: probability

247 ANS: 4 REF: 011808aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

248 ANS: 3

The vertex is  $(-3, 5)$  and  $p = 2$ .  $y = \frac{-1}{4(2)}(x + 3)^2 + 5$

REF: 011914aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

249 ANS: 3

$$e^{bt} = \frac{c}{a}$$

$$\ln e^{bt} = \ln \frac{c}{a}$$

$$bt \ln e = \ln \frac{c}{a}$$

$$t = \frac{\ln \frac{c}{a}}{b}$$

REF: 011813aai NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

250 ANS: 4 REF: 061907aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

251 ANS: 2

$$S_{20} = \frac{.01 - .01(3)^{20}}{1 - 3} = 17,433,922$$

REF: 011822aai NAT: F.BF.B.7 TOP: Series KEY: geometric

252 ANS: 4

$$(x^6 y^4 - 9)(x^4 - 16)$$

$$(x^3 y^2 + 3)(x^3 y^2 - 3)(x^2 + 4)(x^2 - 4)$$

REF: 081814aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

253 ANS: 2

$$P(B) \cdot P(A|B) = P(A \text{ and } B)$$

$$P(B) \cdot 0.8 = 0.2$$

$$P(B) = 0.25$$

REF: 081913aai NAT: S.CP.A.3 TOP: Conditional Probability

254 ANS: 4

$$(a + b + c)^2 = a^2 + ab + ac + ab + b^2 + bc + ac + ab + c^2$$

$$x = a^2 + b^2 + c^2 + 2(ab + bc + ac)$$

$$x = y + 2z$$

REF: 061822aai NAT: A.APR.C.4 TOP: Polynomial Identities

255 ANS: 2 REF: 081908aai NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

256 ANS: 3 REF: 061906aai NAT: F.LE.A.2 TOP: Families of Functions

257 ANS: 2

$$1.00643^{12} \approx 1.08$$

REF: 081808aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

258 ANS: 3 REF: 061824aai NAT: A.CED.A.1 TOP: Modeling Rationals

259 ANS: 4 REF: 081906aai NAT: S.IC.B.3 TOP: Analysis of Data

260 ANS: 4

$$1.06^{\frac{1}{52}}$$

REF: 061924aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

261 ANS: 3

$$\sqrt{x+1} = x+1$$

$$x+1 = x^2 + 2x + 1$$

$$0 = x^2 + x$$

$$0 = x(x+1)$$

$$x = -1, 0$$

REF: 011802aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

262 ANS: 1



REF: 081919aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: percent

263 ANS: 1

2) linear, 3) quadratic, 4) cubic

REF: 061920aai NAT: F.LE.A.2 TOP: Families of Functions

264 ANS: 3

$$y = x^3 - 2$$

$$x = y^3 - 2$$

$$x + 2 = y^3$$

$$\sqrt[3]{x+2} = y$$

REF: 061815aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: cubic

265 ANS: 3

$$x^2 - 4x - 5 = 4x^2 - 40x + 100$$

$$3x^2 - 36x + 105 = 0$$

$$x^2 - 12x + 35 = 0$$

$$(x - 7)(x - 5) = 0$$

$$x = 5, 7$$

REF: 081807aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

266 ANS: 1

$$100 \left( \frac{1}{2} \right)^{\frac{d}{8}} = 100e^{kd}$$

$$\left( \frac{1}{2} \right)^{\frac{1}{8}} = e^k$$

$$k \approx -0.087$$

REF: 061818aai NAT: F.LE.A.4 TOP: Exponential Decay

267 ANS: 2

$$x = 4y + 5$$

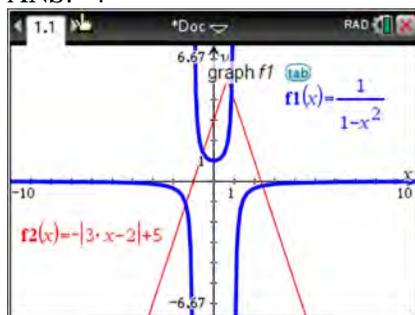
$$x - 5 = 4y$$

$$\frac{1}{4}x - \frac{5}{4} = y$$

REF: 061909aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

268 ANS: 4



REF: 011924aai NAT: A.REI.D.11 TOP: Other Systems

KEY: rational

269 ANS: 2 REF: 081904aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: higher power

270 ANS: 2

$$x + y - z = 6 \quad 2x + 2y - 2z = 12 \quad 5y - 4z = 31 \quad 5y - 2(-4) = 23 \quad x + 3 - (-4) = 6$$

$$\frac{-x + 4y - z = 17}{5y - 2z = 23} \quad \frac{2x - 3y + 2z = -19}{5y - 2z = 23} \quad 5y = 15 \quad x = -1$$

$$5y - 2z = 23 \quad 5y - 4z = 31 \quad -2z = 8 \quad y = 3$$

$$z = -4$$

REF: 061923aai NAT: A.REI.C.6 TOP: Solving Linear Systems  
KEY: three variables

271 ANS: 1

$$1.025^{\frac{1}{12}} \approx 1.00206$$

REF: 081924aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

272 ANS: 2

If  $\cos \theta = \frac{7}{25}$ ,  $\sin \theta = \pm \frac{24}{25}$ , and  $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{-\frac{24}{25}}{\frac{7}{25}} = -\frac{24}{7}$

REF: 081811aai NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

273 ANS: 4

$$wx^2 + w = 0$$

$$w(x^2 + 1) = 0$$

$$x^2 = -1$$

$$x = \pm i$$

REF: 061912aai NAT: A.REI.B.4 TOP: Solving Quadratics  
KEY: complex solutions | taking square roots

274 ANS: 2 REF: 011901aai NAT: S.ID.A.4 TOP: Normal Distributions  
KEY: mean and standard deviation

275 ANS: 1 REF: 011815aai NAT: F.TF.A.2 TOP: Unit Circle

276 ANS: 4 REF: 081824aai NAT: S.CP.A.3 TOP: Conditional Probability

277 ANS: 1 REF: 011814aai NAT: A.REI.D.11 TOP: Other Systems  
KEY: logarithmic



282 ANS: 2

$$x^2 + 4x - 1 = x - 3 \quad y + 3 = -1$$

$$x^2 + 3x + 2 = 0 \quad y = -4$$

$$(x + 2)(x + 1) = 0$$

$$x = -2, -1$$

REF: 061801aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

283 ANS: 1

$$3x + 1 \overline{) 9x^2 + 0x - 2}$$

$$\underline{9x^2 + 3x}$$

$$-3x - 2$$

$$\underline{-3x - 1}$$

$$-1$$

REF: 081910aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

284 ANS: 1

The time of the next high tide will be the midpoint of consecutive low tides.

REF: 011907aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: mixed

285 ANS: 4

There is no  $x$ -intercept.

REF: 011823aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

286 ANS: 1

$$(2x - i)^2 - (2x - i)(2x + 3i)$$

$$(2x - i)[(2x - i) - (2x + 3i)]$$

$$(2x - i)(-4i)$$

$$-8xi + 4i^2$$

$$-8xi - 4$$

REF: 011911aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

287 ANS: 1

REF: 081813aii NAT: F.BF.B.7 TOP: Series

KEY: geometric

288 ANS: 1

$$-4(-1) - 3 = 1 \quad 8 = \frac{2\pi}{b}$$

$$b = \frac{\pi}{4}$$

REF: 081820aai NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

289 ANS: 4

$$(x-y)^2 = x^2 - 2xy + y^2 \quad (x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$

REF: 061902aai NAT: A.APR.C.4 TOP: Polynomial Identities

290 ANS: 3

$$(x+4)^2 - 10 = 3x + 6 \quad y = 3(-5) + 6 = -9$$

$$x^2 + 8x + 16 - 10 = 3x + 6 \quad y = 3(0) + 6 = 6$$

$$x^2 + 5x = 0$$

$$x(x+5) = 0$$

$$x = -5, 0$$

REF: 061903aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

291 ANS: 4

$$a = \frac{14-4}{2} = 5, \quad d = \frac{14+4}{2} = 9$$

REF: 061810aai NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

292 ANS: 1

In vertex form, the parabola is  $y = -\frac{1}{4(2)}(x+4)^2 + 3$ . The vertex is  $(-4, 3)$  and  $p = 2$ .  $3 + 2 = 5$

REF: 011816aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

293 ANS: 2

$$\frac{85}{210+85}$$

REF: 081818aai NAT: S.CP.A.3 TOP: Conditional Probability

294 ANS: 3

$$1.04^{\frac{1}{12}} \approx 1.0032737$$

REF: 011906aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

295 ANS: 4

$$120 = 68 + (195 - 68)e^{-0.05t}$$

$$52 = 127e^{-0.05t}$$

$$\ln \frac{52}{127} = \ln e^{-0.05t}$$

$$\ln \frac{52}{127} = -0.05t$$

$$\frac{\ln \frac{52}{127}}{-0.05} = t$$

$$18 \approx t$$

REF: 081918aai NAT: F.LE.A.4 TOP: Exponential Decay

296 ANS: 2 REF: 011820aai NAT: S.IC.A.2 TOP: Analysis of Data

297 ANS: 4 REF: 061914aai NAT: A.REI.D.11 TOP: Other Systems

KEY: table

298 ANS: 1 REF: 061904aai NAT: F.IF.B.6 TOP: Rate of Change

KEY: graph

299 ANS: 1 REF: 081804aai NAT: F.IF.C.9 TOP: Comparing Functions

300 ANS: 4

$$\frac{x^2 - 4x}{2x} = \frac{x(x-4)}{2x} = \frac{x-4}{2} = \frac{x}{2} - 2 \quad \frac{x-1}{2} - \frac{3}{2} = \frac{x-1-3}{2} = \frac{x-4}{2}$$

REF: 011921aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

301 ANS: 1

$$x^3 + 2x^2 - 9x - 18 = 0 \quad x^3 - 9x + 2x^2 - 18 = 0 \quad x^3 - 9x + 2x^2 - 18 = 0$$

$$x^2(x+2) - 9(x+2) = 0 \quad x(x^2 - 9) + 2(x^2 - 9) = 0 \quad x(x^2 - 9) + 2(x^2 - 9) = 0$$

$$(x+2)(x^2 - 9) = 0$$

REF: 011903aai NAT: A.APR.B.3 TOP: Solving Polynomial Equations

302 ANS: 3 REF: 011917aai NAT: F.BF.B.5 TOP: Inverse of Functions

KEY: exponential

303 ANS: 4

$$\sqrt{3x^2y} \cdot \sqrt[3]{27x^3y^2} = 3^{\frac{1}{2}}x^{\frac{1}{2}}y^{\frac{1}{2}} \cdot 3^{\frac{2}{3}}x^{\frac{2}{3}}y^{\frac{2}{3}} = 3^{\frac{3}{2}}x^2y^{\frac{7}{6}}$$

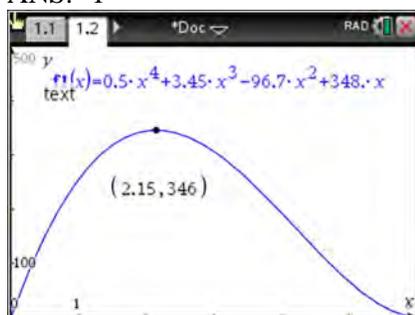
REF: 081914aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

304 ANS: 4 REF: 011801aai NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

305 ANS: 4 REF: 081817aai NAT: F.BF.B.3 TOP: Transformations with Functions

306 ANS: 1



REF: 011908aai NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

307 ANS: 2

$$4x \cdot x^{\frac{2}{3}} + 2x^{\frac{5}{3}} = 4x^{\frac{5}{3}} + 2x^{\frac{5}{3}} = 6x^{\frac{5}{3}} = 6\sqrt[3]{x^5}$$

REF: 061820aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

308 ANS: 2 REF: 061804aai NAT: S.ID.B.6 TOP: Regression

KEY: choose model

309 ANS: 4

The vertex is (2,2) and  $p = 3$ .  $3 + 2 = 5$ 

REF: 081823aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

310 ANS: 4

$$400 \cdot .954 \approx 380$$

REF: 061918aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: predict

311 ANS: 3 REF: 061901aai NAT: S.IC.B.3 TOP: Analysis of Data

312 ANS: 4

$$5000 \left( 1 + \frac{.035}{12} \right)^{12 \cdot 6} \approx 6166.50$$

REF: 081917aai NAT: F.LE.A.2 TOP: Modeling Exponential Functions

313 ANS: 4

$$m^3 - 2m^2 + 4m - 8 = 0$$

$$m^2(m-2) + 4(m-2) = 0$$

$$(m^2 + 4)(m-2) = 0$$

REF: 081821aai NAT: A.APR.B.3 TOP: Solving Polynomial Equations

314 ANS: 2 REF: 061816aai NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

KEY: bimodalgraph

315 ANS: 4

$$\frac{2}{x} = \frac{4x}{x+3}$$

$$2x+6 = 4x^2$$

$$4x^2 - 2x - 6 = 0$$

$$2(2x^2 - x - 3) = 0$$

$$(2x-3)(x+1) = 0$$

$$x = \frac{3}{2}, -1$$

REF: 061809aai NAT: A.REI.A.2 TOP: Solving Rationals

316 ANS: 4

$$\begin{array}{r} \phantom{2x-1} \overline{) 10x^3 - 3x^2 - 7x + 3} \\ \underline{10x^3 - 5x^2} \phantom{+ 3} \\ 2x^2 - 7x \phantom{+ 3} \\ \underline{2x^2 - x} \phantom{+ 3} \\ -6x + 3 \\ \underline{-6x + 3} \\ \phantom{-6x + 3} \end{array}$$

REF: 011809aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

317 ANS: 2 REF: 061917aai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

318 ANS: 4

$$\frac{5+9}{2} = 7, \text{ vertex: } (-2, 7); p = 7 - 9 = -2, y = \frac{1}{4(-2)}(x+2)^2 + 7$$

$$y - 7 = \frac{1}{-8}(x+2)^2$$

$$-8(y - 7) = (x+2)^2$$

REF: 061821aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

319 ANS: 3 REF: 081909aai NAT: F.BF.A.2 TOP: Sequences

KEY: recursive

320 ANS: 2

$$2 - \frac{x-1}{x+2} = 1 + \frac{x+2}{x+2} - \frac{x-1}{x+2} = 1 + \frac{x+2-(x-1)}{x+2} = 1 + \frac{3}{x+2}$$

REF: 081907aai NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

321 ANS: 1  
 $84.1\% \times 750 \approx 631$

REF: 011923aia NAT: S.ID.A.4 TOP: Normal Distributions

KEY: predict

322 ANS: 3  
 $T(19) = 8 \sin(0.3(19) - 3) + 74 \approx 77$

REF: 061922aia NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

323 ANS: 2  

$$P = \frac{2\pi}{\frac{\pi}{45}} = 90$$

REF: 081822aia NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: period

324 ANS: 3  
 $440 \times 2.3\% \approx 10$

REF: 011807aia NAT: S.ID.A.4 TOP: Normal Distributions

KEY: predict

325 ANS: 1 REF: 011902aia NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

326 ANS: 2 REF: 011804aia NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

327 ANS: 3  

$$x = \frac{-2 \pm \sqrt{2^2 - 4(3)(7)}}{2(3)} = \frac{-2 \pm \sqrt{-80}}{6} = \frac{-2 \pm i\sqrt{16}\sqrt{5}}{6} = -\frac{1}{3} \pm \frac{2i\sqrt{5}}{3}$$

REF: 081809aia NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

328 ANS: 2  

$$\begin{aligned} & n^2(n^2 - 9) + 4n(n^2 - 9) - 12(n^2 - 9) \\ & (n^2 + 4n - 12)(n^2 - 9) \\ & (n + 6)(n - 2)(n + 3)(n - 3) \end{aligned}$$

REF: 061911aia NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

329 ANS: 1  

$$\frac{N(10) - N(1)}{10 - 1} \approx -2.03, \frac{N(20) - N(10)}{20 - 10} \approx -1.63, \frac{N(25) - N(15)}{25 - 15} \approx -1.46, \frac{N(30) - N(1)}{30 - 1} \approx -1.64$$

REF: 061807aia NAT: F.IF.B.6 TOP: Rate of Change

KEY: exponential

330 ANS: 2

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(5)(4)}}{2(5)} = \frac{2 \pm \sqrt{-76}}{10} = \frac{2 \pm i\sqrt{4}\sqrt{19}}{10} = \frac{1}{5} \pm \frac{i\sqrt{19}}{5}$$

REF: 011905aii NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

331 ANS: 3 REF: 011824aii NAT: F.BF.A.2 TOP: Sequences

KEY: recursive

332 ANS: 4

$$3x - (-2x + 14) = 16 \quad 3(6) - 4z = 2$$

$$5x = 30 \quad -4z = -16$$

$$x = 6 \quad z = 4$$

REF: 011803aii NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

333 ANS: 1

$$x - \frac{4}{x-1} = 2 \quad x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)} = \frac{3 \pm \sqrt{17}}{2}$$

$$x(x-1) - 4 = 2(x-1)$$

$$x^2 - x - 4 = 2x - 2$$

$$x^2 - 3x - 2 = 0$$

REF: 011812aii NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

334 ANS: 2 REF: 011910aii NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

335 ANS: 3

The screenshot shows a TI-84 Plus calculator window with the following content:

```

1.1 | *Doc | RAD | Done
Define r(a) = 1 / (0.0105 * ln(a / 5000))
r(8000) - r(6000) | 0.013699
8000 - 6000
r(12000) - r(9000) | 0.009133
12000 - 9000

```

REF: 081922aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: logarithmic

336 ANS: 2

(1)  $0.4 \cdot 0.3 \neq 0.2$ , (2)  $0.8 \cdot 0.25 = 0.2$ , (3)  $P(A|B) = P(A) = 0.2$ , (4)  $0.2 \neq 0.15 \cdot 0.05$ 

$$0.2 \neq 0.2 \cdot 0.2$$

REF: 011912aai NAT: S.CP.A.2 TOP: Probability of Compound Events

337 ANS: 1

$$-\sqrt{1 - \left(-\frac{3}{4}\right)^2} = -\sqrt{\frac{16}{16} - \frac{9}{16}} = -\sqrt{\frac{7}{16}} = -\frac{\sqrt{7}}{4}$$

REF: 081905aai NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

338 ANS: 3

$$-3 + 5i - (4 + 24i - 2i - 12i^2) = -3 + 5i - (16 + 22i) = -19 - 17i$$

REF: 081815aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

339 ANS: 4

REF: 062215aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

340 ANS: 1

The cosine function has been translated +3. Since the maximum is 5 and the minimum is 1, the amplitude is 2.

$$\frac{\pi}{3} = \frac{2\pi}{b}$$

$$b = 6$$

REF: 011913aai NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

341 ANS: 3

$$\frac{x^2(x+2) - 9(x+2)}{x(x^2 - x - 6)} = \frac{(x^2 - 9)(x+2)}{x(x-3)(x+2)} = \frac{(x+3)(x-3)}{x(x-3)} = \frac{x+3}{x}$$

REF: 061803aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

342 ANS: 2

$$x = \frac{y}{y+2}$$

$$xy + 2x = y$$

$$xy - y = -2x$$

$$y(x-1) = -2x$$

$$y = \frac{-2x}{x-1}$$

REF: 081924aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: rational

343 ANS: 4

$$a_1 = 2.5 + 0.5(1) = 3$$

REF: 011916aai NAT: F.BF.A.2 TOP: Sequences KEY: recursive

344 ANS: 1

$$6 - (3x - 2i)(3x - 2i) = 6 - (9x^2 - 12xi + 4i^2) = 6 - 9x^2 + 12xi + 4 = -9x^2 + 12xi + 10$$

REF: 061915aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

345 ANS: 2

$$u = x + 2 \quad u^2 + 4u + 3$$

$$(u + 3)(u + 1)$$

$$(x + 2 + 3)(x + 2 + 1)$$

$$(x + 5)(x + 3)$$

REF: 081901aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: higher power

346 ANS: 4

REF: 011805aai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

347 ANS: 3

$$(x + 3i)^2 - (2x - 3i)^2 = x^2 + 6xi + 9i^2 - (4x^2 - 12xi + 9i^2) = -3x^2 + 18xi$$

REF: 061805aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

348 ANS: 3

$$1^3 - k(1)^2 + 2(1) = 0$$

$$k = 3$$

REF: 061812aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

349 ANS: 2

REF: 081802aai NAT: S.IC.B.3 TOP: Analysis of Data

350 ANS: 2

REF: 011806aai NAT: A.APR.C.4 TOP: Polynomial Identities

351 ANS: 3

$$y = 278(0.5)^{\frac{18}{1.8}} \approx 0.271$$

REF: 011920aai NAT: F.LE.A.2 TOP: Modeling Exponential Functions

352 ANS: 4

REF: 061921aai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

353 ANS: 4

$$S_7 = \frac{85000 - 85000(1.06)^7}{1 - 1.06} \approx 713476.20$$

REF: 061905aai NAT: F.BF.B.7 TOP: Series KEY: geometric

354 ANS: 2

$$121(b)^2 = 64 \quad 64\left(\frac{8}{11}\right)^2 \approx 34$$

$$b = \frac{8}{11}$$

REF: 011904aia NAT: F.BF.A.2 TOP: Sequences KEY: explicit

355 ANS: 4 REF: 081810aia NAT: F.BF.A.2 TOP: Sequences  
KEY: recursive

356 ANS: 3

$$x^2 + (2x)^2 = 5 \quad y = 2x = \pm 2$$

$$x^2 + 4x^2 = 5$$

$$5x^2 = 5$$

$$x = \pm 1$$

REF: 081916aia NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

357 ANS: 4  
 $0.48 \cdot 0.25 = 0.12$ 

REF: 061811aia NAT: S.CP.A.2 TOP: Probability of Compound Events

358 ANS: 2

$$b^2 = 2b^2 - 64 \quad -8 \text{ is extraneous.}$$

$$-b^2 = -64$$

$$b = \pm 8$$

REF: 061919aia NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

359 ANS: 4

The maximum of  $p$  is 5. The minimum of  $f$  is  $-\frac{21}{4}$  ( $x = \frac{-6}{2(4)} = -\frac{3}{4}$ )

$$f\left(-\frac{3}{4}\right) = 4\left(-\frac{3}{4}\right)^2 + 6\left(-\frac{3}{4}\right) - 3 = 4\left(\frac{9}{16}\right) - \frac{18}{4} - \frac{12}{4} = -\frac{21}{4}. \quad \frac{20}{4} - \left(-\frac{21}{4}\right) = \frac{41}{4} = 10.25$$

REF: 011922aia NAT: F.IF.C.9 TOP: Comparing Functions

360 ANS: 2

$$f(x) = f(-x)$$

$$x^2 - 4 = (-x)^2 - 4$$

$$x^2 - 4 = x^2 - 4$$

REF: 061806aia NAT: F.BF.B.3 TOP: Even and Odd Functions

361 ANS: 2 REF: 081816aia NAT: F.BF.B.5 TOP: Inverse of Functions  
KEY: bimodalgraph | exponential

362 ANS: 3

$$\frac{x^{\frac{2}{3}} \cdot x^{\frac{5}{2}}}{x^{\frac{1}{6}}} = \frac{x^{\frac{4}{6}} \cdot x^{\frac{15}{6}}}{x^{\frac{1}{6}}} = x^{\frac{18}{6}} = x^3$$

REF: 081812aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

363 ANS: 2

$$x = -6(y - 2)$$

$$-\frac{x}{6} = y - 2$$

$$-\frac{x}{6} + 2 = y$$

REF: 011821aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

364 ANS: 1

$$1) (x + 3)^2 - 16 = x^2 + 6x + 9 - 16 = x^2 + 6x - 7 = (x + 7)(x - 1); 2) u = x + 3 ; 3)$$

$$u^2 - 10u - 2u + 20$$

$$u(u - 10) - 2(u - 10)$$

$$(u - 2)(u - 10)$$

$$(x + 3 - 2)(x + 3 - 10)$$

$$(x + 1)(x - 7)$$

$$\frac{(x - 1)(x - 7)(x + 1)}{(x + 1)} = (x - 1)(x - 7); 4) \frac{(x + 7)(x + 1)(x + 3)}{(x + 3)} = (x + 7)(x + 1)$$

REF: 061808aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

365 ANS: 4

REF: 081803aai NAT: F.BF.A.1 TOP: Operations with Functions

366 ANS: 2

$$y = \frac{1}{2}x + 8 \quad x = \frac{1}{2}y + 8$$

$$2x = y + 16$$

$$y = 2x - 16$$

REF: 081806aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

367 ANS: 1

$$(x^{\frac{3}{2}})^2 = x^3$$

REF: 061908aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

368 ANS: 4

(1) quadratic has two roots and both are real  $(-2,0)$  and  $(-0.5,0)$ , (2)  $x = \pm\sqrt{32} - 3$ , (3) the real root is 3, with a multiplicity of 2, (4)  $x = \pm 4i$

REF: 011909aai NAT: A.REI.B.4 TOP: Using the Discriminant

KEY: determine nature of roots

369 ANS: 3

$$\frac{2}{3x+1} = \frac{1}{x} - \frac{6x}{3x+1} - \frac{1}{3} \text{ is extraneous.}$$

$$\frac{6x+2}{3x+1} = \frac{1}{x}$$

$$6x^2 + 2x = 3x + 1$$

$$6x^2 - x - 1 = 0$$

$$(2x-1)(3x+1) = 0$$

$$x = \frac{1}{2}, -\frac{1}{3}$$

REF: 011915aai NAT: A.REI.A.2 TOP: Solving Rationals

370 ANS: 4

$$x(x-2)\left(\frac{10}{x^2-2x} + \frac{4}{x} = \frac{5}{x-2}\right) \text{ 2 is extraneous.}$$

$$10 + 4(x-2) = 5x$$

$$10 + 4x - 8 = 5x$$

$$2 = x$$

REF: 081915aai NAT: A.REI.A.2 TOP: Solving Rationals

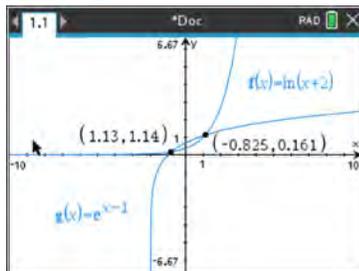
KEY: rational solutions

371 ANS: 1

$$x^2 + 2x + 1 = (x+1)^2$$

REF: 011919aai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

372 ANS: 2



REF: 081920aai NAT: A.REI.D.11 TOP: Other Systems

KEY: logarithmic

373 ANS: 3

$$\frac{c^2 - d^2}{d^2 + cd - 2c^2} = \frac{(c+d)(c-d)}{(d+2c)(d-c)} = \frac{-(c+d)}{d+2c} = \frac{-c-d}{d+2c}$$

REF: 011818aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

374 ANS: 4

$$\ln e^{0.3x} = \ln \frac{5918}{87}$$

$$x = \frac{\ln \frac{5918}{87}}{0.3}$$

REF: 081801aai NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

375 ANS: 3 REF: 061910aai NAT: F.IF.A.3 TOP: Sequences

KEY: difference or ratio

376 ANS: 2

$$0.254 \pm 2(0.060) \rightarrow (0.134, 0.374)$$

REF: 061913aai NAT: S.IC.B.5 TOP: Analysis of Data

377 ANS: 4

$$p(5) = 2(5)^3 - 3(5) + 5 = 240$$

REF: 011819aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

378 ANS: 4

$$f(x) = (x+1)(x-1)(x-2) = (x^2 - 1)(x-2) = x^3 - 2x^2 - x + 2$$

REF: 081921aai NAT: A.APR.B.3 TOP: Solving Polynomial Equations

379 ANS: 4 REF: 081912aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

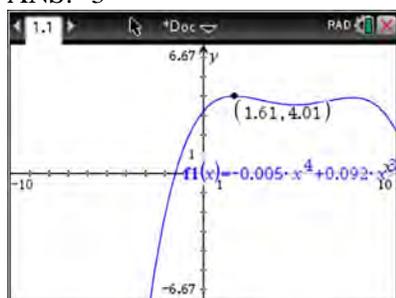
KEY: mixed

380 ANS: 4

$$1 + \frac{.009}{12} = 1.00075$$

REF: 011918aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

381 ANS: 3



REF: 011817aai

NAT: F.IF.B.4

TOP: Graphing Polynomial Functions

## Algebra II Multiple Choice Regents Exam Questions

## Answer Section

382 ANS: 4

$$(1) \frac{B(60) - B(10)}{60 - 10} \approx 28\% \quad (2) \frac{B(69) - B(19)}{69 - 19} \approx 33\% \quad (3) \frac{B(72) - B(36)}{72 - 36} \approx 38\% \quad (4) \frac{B(73) - B(60)}{73 - 60} \approx 46\%$$

REF: 011721aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: exponential

383 ANS: 3

$$1.0525^{\frac{1}{12}} \approx 1.00427$$

REF: 061621aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

384 ANS: 1

The probability of rain equals the probability of rain, given that Sean pitches.

REF: 061611aii NAT: S.CP.A.3 TOP: Conditional Probability

385 ANS: 1

REF: 061708aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

386 ANS: 1



REF: 081711aii NAT: S.ID.A.4 TOP: Normal Distributions

KEY: percent

387 ANS: 1

The zeros of the polynomial are at  $-b$ , and  $c$ . The sketch of a polynomial of degree 3 with a negative leading coefficient should have end behavior showing as  $x$  goes to negative infinity,  $f(x)$  goes to positive infinity. The multiplicities of the roots are correctly represented in the graph.

REF: spr1501aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

KEY: bimodalgraph

388 ANS: 1

REF: 011704aii NAT: F.TF.C.8 TOP: Proving Trigonometric Identities

KEY: basic

389 ANS: 1

$$8(2^{x+3}) = 48$$

$$2^{x+3} = 6$$

$$(x+3)\ln 2 = \ln 6$$

$$x+3 = \frac{\ln 6}{\ln 2}$$

$$x = \frac{\ln 6}{\ln 2} - 3$$

REF: 061702aai NAT: F.LE.A.4 TOP: Exponential Equations

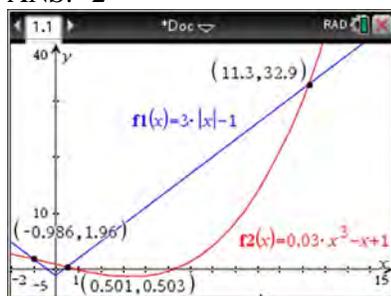
KEY: without common base

390 ANS: 4

The vertex is  $(2, -1)$  and  $p = 2$ .  $y = -\frac{1}{4(2)}(x-2)^2 - 1$

REF: 081619aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

391 ANS: 2



REF: 061705aai NAT: A.REI.D.11 TOP: Other Systems

KEY: polynomial

392 ANS: 2

Combining (1) and (3):  $-6c = -18$  Combining (1) and (2):  $5a + 3c = -1$  Using (3):  $-(-2) - 5b - 5(3) = 2$

$$c = 3$$

$$5a + 3(3) = -1$$

$$2 - 5b - 15 = 2$$

$$5a = -10$$

$$b = -3$$

$$a = -2$$

REF: 081623aai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

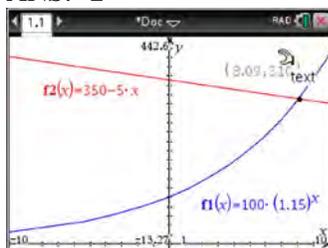
393 ANS: 3

REF: 061722aai

NAT: A.CED.A.1

TOP: Modeling Rationals

394 ANS: 2



REF: 011716aia NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

395 ANS: 2 REF: 011720aia NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

396 ANS: 4 REF: 081624aia NAT: F.BF.A.2 TOP: Sequences

KEY: recursive

397 ANS: 2

$$\left(m \frac{5}{3}\right)^{-\frac{1}{2}} = m^{-\frac{5}{6}} = \frac{1}{\sqrt[6]{m^5}}$$

REF: 011707aia NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

398 ANS: 3

$$2d(d^3 + 3d^2 - 9d - 27)$$

$$2d(d^2(d+3) - 9(d+3))$$

$$2d(d^2 - 9)(d+3)$$

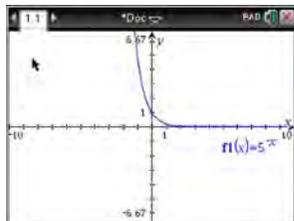
$$2d(d+3)(d-3)(d+3)$$

$$2d(d+3)^2(d-3)$$

REF: 081615aia NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

399 ANS: 4



$$y = 5^{-x} = \left(\frac{1}{5}\right)^x$$

REF: 061615aia NAT: F.IF.C.7 TOP: Graphing Exponential Functions

400 ANS: 2

The events are independent because  $P(A \text{ and } B) = P(A) \cdot P(B)$ .

$$0.125 = 0.5 \cdot 0.25$$

If  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = 0.25 + 0.5 - .125 = 0.625$ , then the events are not mutually exclusive because  $P(A \text{ or } B) = P(A) + P(B)$

$$0.625 \neq 0.5 + 0.25$$

REF: 061714aai NAT: S.CP.A.3 TOP: Conditional Probability

401 ANS: 4

$$y = g(x) = (x-2)^2 \quad (x-2)^2 = 3x-2 \quad y = 3(6) - 2 = 16$$

$$x^2 - 4x + 4 = 3x - 2 \quad y = 3(1) - 2 = 1$$

$$x^2 - 7x + 6 = 0$$

$$(x-6)(x-1) = 0$$

$$x = 6, 1$$

REF: 011705aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

402 ANS: 2 REF: 081610aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

KEY: increasing/decreasing

403 ANS: 3

The pattern suggests an exponential pattern, not linear or sinusoidal. A 4% growth rate is accurate, while a 43% growth rate is not.

REF: 011713aai NAT: S.ID.B.6 TOP: Regression KEY: choose model

404 ANS: 1

$$\frac{A}{P} = e^{rt}$$

$$0.42 = e^{rt}$$

$$\ln 0.42 = \ln e^{rt}$$

$$-0.87 \approx rt$$

REF: 011723aai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

405 ANS: 3 REF: 011706aai NAT: S.IC.B.3 TOP: Analysis of Data

406 ANS: 2 REF: 011709aai NAT: S.IC.B.5 TOP: Analysis of Data

407 ANS: 3 REF: 061602aai NAT: A.CED.A.1 TOP: Modeling Rationals

408 ANS: 3 REF: 011708aai NAT: F.BF.B.5 TOP: Inverse of Functions

KEY: exponential

409 ANS: 4

$$\frac{-3x^2 - 5x + 2}{x^3 + 2x^2} = \frac{(-3x+1)(x+2)}{x^2(x+2)} = \frac{-3x}{x^2} + \frac{1}{x^2} = -3x^{-1} + x^{-2}$$

REF: 061723aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

410 ANS: 2

$$\begin{array}{r}
 2x^2 - 3x + 7 \\
 2x + 3 \overline{) 4x^3 + 0x^2 + 5x + 10} \\
 \underline{4x^3 + 6x^2} \phantom{+ 5x + 10} \\
 -6x^2 + 5x \phantom{+ 10} \\
 \underline{-6x^2 - 9x} \phantom{+ 10} \\
 14x + 10 \\
 \underline{14x + 21} \\
 -11
 \end{array}$$

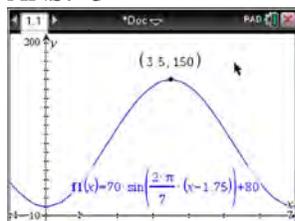
REF: 061614aai NAT: A.APR.D.6 TOP: Rational Expressions  
 KEY: division

411 ANS: 1

$$\begin{array}{r}
 157 \\
 \hline
 25 + 47 + 157
 \end{array}$$

REF: 081607aai NAT: S.CP.A.4 TOP: Conditional Probability

412 ANS: 3



$H(t)$  is at a minimum at  $70(-1) + 80 = 10$

REF: 061613aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions  
 KEY: maximum/minimum

413 ANS: 4

$$\frac{m(c)}{g(c)} = \frac{c+1}{1-c^2} = \frac{c+1}{(1+c)(1-c)} = \frac{1}{1-c}$$

REF: 061608aai NAT: F.BF.A.1 TOP: Operations with Functions

414 ANS: 3 REF: 061623aai NAT: F.BF.A.2 TOP: Sequences

KEY: recursive

415 ANS: 4 REF: 061716aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

416 ANS: 1

$$\begin{array}{r}
 3x^2 + 4x - 1 \\
 2x + 3 \overline{) 6x^3 + 17x^2 + 10x + 2} \\
 \underline{6x^3 + 9x^2} \phantom{+ 10x + 2} \\
 8x^2 + 10x \phantom{+ 2} \\
 \underline{8x^2 + 12x} \phantom{+ 2} \\
 -2x + 2 \\
 \underline{-2x - 3} \\
 5
 \end{array}$$

REF: fall1503aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

417 ANS: 3

Since  $x + 4$  is a factor of  $p(x)$ , there is no remainder.

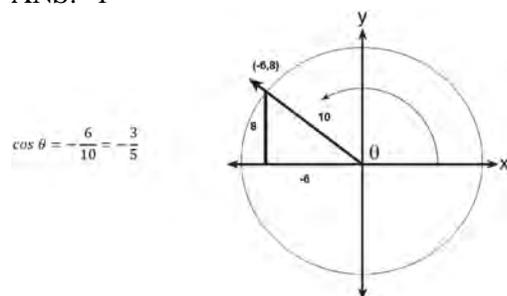
REF: 081621aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

418 ANS: 2

$$6xi^3(-4xi + 5) = -24x^2i^4 + 30xi^3 = -24x^2(1) + 30x(-1) = -24x^2 - 30xi$$

REF: 061704aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

419 ANS: 1



REF: 061617aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions

KEY: extension to reals

420 ANS: 4

$$4x^2 = -98$$

$$x^2 = -\frac{98}{4}$$

$$x^2 = -\frac{49}{2}$$

$$x = \pm \sqrt{-\frac{49}{2}} = \pm \frac{7i}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \pm \frac{7i\sqrt{2}}{2}$$

REF: 061707aii NAT: A.REI.B.4 TOP: Solving Quadratics

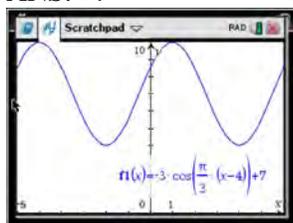
KEY: complex solutions | taking square roots

421 ANS: 3

REF: 081618aii NAT: F.BF.A.2 TOP: Sequences

KEY: recursive

422 ANS: 4



As the range is  $[4, 10]$ , the midline is  $y = \frac{4+10}{2} = 7$ .

REF: fall1506aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: mixed

423 ANS: 4

The vertex is  $(1, 0)$  and  $p = 2$ .  $y = \frac{1}{4(2)}(x-1)^2 + 0$

REF: 061717aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

424 ANS: 3

The graph shows three real zeros, and has end behavior matching the given end behavior.

REF: 061604aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

KEY: bimodalgraph

425 ANS: 1

The graph of  $y = \sin x$  is unchanged when rotated  $180^\circ$  about the origin.

REF: 081614aii NAT: F.BF.B.3 TOP: Even and Odd Functions

426 ANS: 2

$h(x)$  does not have a  $y$ -intercept.

REF: 011719aii NAT: F.IF.C.9 TOP: Comparing Functions

427 ANS: 2

$$ME = \left( z \sqrt{\frac{p(1-p)}{n}} \right) = \left( 1.96 \sqrt{\frac{(0.55)(0.45)}{900}} \right) \approx 0.03 \text{ or } \frac{1}{\sqrt{900}} \approx 0.03$$

REF: 081612aii NAT: S.IC.B.4 TOP: Analysis of Data

428 ANS: 4 REF: 081718aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: amplitude

429 ANS: 2

$B(t) = 750 \left( 1.16^{\frac{1}{12}} \right)^{12t} \approx 750(1.012)^{12t}$   $B(t) = 750 \left( 1 + \frac{0.16}{12} \right)^{12t}$  is wrong, because the growth is an annual rate that is not compounded monthly.

REF: spr1504aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

430 ANS: 2

$$\sqrt{x+14} = \sqrt{2x+5} + 1 \qquad \sqrt{22+14} - \sqrt{2(22)+5} = 1$$

$$x+14 = 2x+5+2\sqrt{2x+5}+1 \qquad 6-7 \neq 1$$

$$-x+8 = 2\sqrt{2x+5}$$

$$x^2 - 16x + 64 = 8x + 20$$

$$x^2 - 24x + 44 = 0$$

$$(x-22)(x-2) = 0$$

$$x = 2, 22$$

REF: 081704aii NAT: A.REI.A.2 TOP: Solving Radicals

KEY: advanced

431 ANS: 3

$$-2\left(-\frac{1}{2}x^2 = -6x + 20\right)$$

$$x^2 - 12x = -40$$

$$x^2 - 12x + 36 = -40 + 36$$

$$(x-6)^2 = -4$$

$$x-6 = \pm 2i$$

$$x = 6 \pm 2i$$

REF: fall1504aii NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | completing the square

432 ANS: 4

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(6)(29)}}{2(6)} = \frac{8 \pm \sqrt{-632}}{12} = \frac{8 \pm i\sqrt{4}\sqrt{158}}{12} = \frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$$

REF: 011711aii NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

433 ANS: 3

$$\frac{1}{J} = \frac{1}{F} - \frac{1}{W}$$

$$\frac{1}{J} = \frac{W-F}{FW}$$

$$J = \frac{FW}{W-F}$$

REF: 081617aii NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

434 ANS: 2

REF: 011701aii

NAT: F.IF.B.4

TOP: Graphing Trigonometric Functions

435 ANS: 2

The 2010 population is 110 million.

REF: 061718aai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

436 ANS: 1

$$\begin{array}{r}
 2x^2 + x + 5 \\
 2x - 1 \overline{) 4x^3 + 0x^2 + 9x - 5} \\
 \underline{4x^3 - 2x^2} \phantom{+ 9x - 5} \\
 2x^2 + 9x \phantom{- 5} \\
 \underline{2x^2 - x} \phantom{- 5} \\
 10x - 5 \\
 \underline{10x - 5} \\
 0
 \end{array}$$

REF: 081713aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

437 ANS: 3 REF: 011710aai NAT: F.BF.A.1 TOP: Operations with Functions

438 ANS: 3

$$\log_{0.8} \left( \frac{V}{17000} \right) = t \qquad \frac{17,000(0.8)^3 - 17,000(0.8)^1}{3 - 1} \approx -2450$$

$$0.8^t = \frac{V}{17000}$$

$$V = 17000(0.8)^t$$

REF: 081709aai NAT: F.IF.B.6 TOP: Rate of Change

KEY: logarithmic

439 ANS: 3 REF: 061710aai NAT: S.IC.A.2 TOP: Analysis of Data

440 ANS: 3

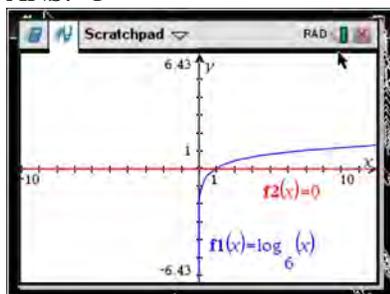
$$d = 10 \log \frac{6.3 \times 10^{-3}}{1.0 \times 10^{-12}} \approx 98$$

REF: 011715aai NAT: F.IF.B.4 TOP: Evaluating Logarithmic Expressions

441 ANS: 3 REF: 081724aai NAT: F.BF.A.2 TOP: Sequences

KEY: recursive

442 ANS: 1



REF: 061618aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

443 ANS: 1

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & -4 & -4 & 8 \\ & & 2 & 4 & 0 & -8 \\ \hline & 1 & 2 & 0 & -4 & 0 \end{array}$$

Since there is no remainder when the quartic is divided by  $x - 2$ , this binomial is a factor.

REF: 061711aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

444 ANS: 4

|                | Bar Harbor | Phoenix |
|----------------|------------|---------|
| <b>Minimum</b> | 31.386     | 66.491  |
| <b>Midline</b> | 55.3       | 86.729  |
| <b>Maximum</b> | 79.214     | 106.967 |
| <b>Range</b>   | 47.828     | 40.476  |

REF: 061715aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

KEY: maximum/minimum

445 ANS: 2

$$\begin{array}{r|rrrr} -4 & 1 & -11 & 16 & 84 \\ & & -4 & 60 & -304 \\ \hline & 1 & -15 & 76 & \end{array}$$

Since there is a remainder when the cubic is divided by  $x + 4$ , this binomial is not a factor.

REF: 081720aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

446 ANS: 4 REF: 061601aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

447 ANS: 1

$$p(x) = r(x) - c(x)$$

$$-0.5x^2 + 250x - 300 = -0.3x^2 + 150x - c(x)$$

$$c(x) = 0.2x^2 - 100x + 300$$

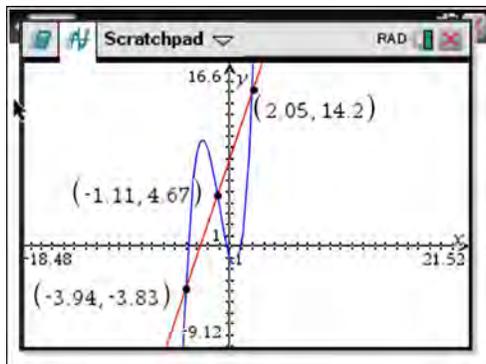
REF: 061813aai NAT: F.BF.A.1 TOP: Operations with Functions

448 ANS: 4

$$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3 \neq x^3 + 3xy + y^3$$

REF: 081620aai NAT: A.APR.C.4 TOP: Polynomial Identities

449 ANS: 4



REF: 061622aai NAT: A.REI.D.11 TOP: Other Systems

KEY: polynomial

450 ANS: 2

$$\frac{212}{1334} \approx .16 \quad ME = \left( z \sqrt{\frac{p(1-p)}{n}} \right) = \left( 1.96 \sqrt{\frac{(0.16)(0.84)}{1334}} \right) \approx 0.02 \quad \text{or} \quad \frac{1}{\sqrt{1334}} \approx .027$$

REF: 081716aai NAT: S.IC.B.4 TOP: Analysis of Data

451 ANS: 4 REF: 081622aai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

452 ANS: 1 REF: 061701aai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

453 ANS: 3

$$-33t^2 + 360t = 700 + 5t$$

$$-33t^2 + 355t - 700 = 0$$

$$t = \frac{-355 \pm \sqrt{355^2 - 4(-33)(-700)}}{2(-33)} \approx 3,8$$

REF: 081606aai NAT: A.REI.D.11 TOP: Quadratic-Linear Systems

454 ANS: 4 REF: 081708aai NAT: A.APR.B.3 TOP: Solving Polynomial Equations

455 ANS: 4

$$m^5 + m^3 - 6m = m(m^4 + m^2 - 6) = m(m^2 + 3)(m^2 - 2)$$

REF: 011703aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: higher power

456 ANS: 1

$$x^2 + 2x - 8 = 0$$

$$(x + 4)(x - 2) = 0$$

$$x = -4, 2$$

REF: 081701aii NAT: A.APR.D.6 TOP: Undefined Rationals

457 ANS: 3

$$\frac{f(7) - f(-7)}{7 - (-7)} = \frac{2^{-0.25(7)} \bullet \sin\left(\frac{\pi}{2}(7)\right) - 2^{-0.25(-7)} \bullet \sin\left(\frac{\pi}{2}(-7)\right)}{14} \approx -0.26$$

REF: 061721aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: trigonometric

458 ANS: 4

The scenario represents a decreasing geometric sequence with a common ratio of 0.80.

REF: 061610aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive

459 ANS: 1

$$(x + 3)^2 + (2x - 4)^2 = 8 \quad b^2 - 4ac$$

$$x^2 + 6x + 9 + 4x^2 - 16x + 16 = 8 \quad 100 - 4(5)(17) < 0$$

$$5x^2 - 10x + 17 = 0$$

REF: 081719aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

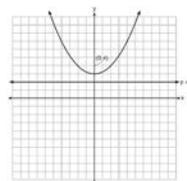
460 ANS: 4

$$\left(\frac{-54x^9}{y^4}\right)^{\frac{2}{3}} = \frac{(2 \cdot -27)^{\frac{2}{3}} x^{\frac{18}{3}}}{y^{\frac{8}{3}}} = \frac{2^{\frac{2}{3}} \cdot 9x^6}{y^2 \cdot y^{\frac{2}{3}}} = \frac{9x^6 \sqrt[3]{4}}{y^2 \sqrt[3]{y^2}}$$

REF: 081723aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

461 ANS: 4



A parabola with a focus of  $(0,4)$  and a directrix of  $y = 2$  is sketched as follows: By inspection, it is determined that the vertex of the parabola is  $(0,3)$ . It is also evident that the distance,  $p$ , between the vertex and the focus is 1. It is possible to use the formula  $(x - h)^2 = 4p(y - k)$  to derive the equation of the parabola as follows:  $(x - 0)^2 = 4(1)(y - 3)$

$$x^2 = 4y - 12$$

$$x^2 + 12 = 4y$$

$$\frac{x^2}{4} + 3 = y$$

or A point  $(x,y)$  on the parabola must be the same distance from the focus as it is from the directrix. For any such point  $(x,y)$ , the distance to the focus is  $\sqrt{(x-0)^2 + (y-4)^2}$  and the distance to the directrix is  $y - 2$ . Setting this equal leads to:  $x^2 + y^2 - 8y + 16 = y^2 - 4y + 4$

$$x^2 + 16 = 4y + 4$$

$$\frac{x^2}{4} + 3 = y$$

REF: spr1502aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

462 ANS: 1

1) let  $y = x + 2$ , then  $y^2 + 2y - 8$ 

$$(y + 4)(y - 2)$$

$$(x + 2 + 4)(x + 2 - 2)$$

$$(x + 6)x$$

REF: 081715aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: multivariable

463 ANS: 2 REF: 061724aii NAT: F.BF.B.7 TOP: Series

KEY: geometric

464 ANS: 4

$$4(x^2 - 6x + 9) + 4(y^2 + 18y + 81) = 76 + 36 + 324$$

$$4(x - 3)^2 + 4(y + 9)^2 = 436$$

REF: 061619aii NAT: G.GPE.A.1 TOP: Equations of Circles

KEY: completing the square

465 ANS: 3 REF: 081705aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

KEY: increasing/decreasing

466 ANS: 2

$$x = \frac{y+1}{y-2}$$

$$xy - 2x = y + 1$$

$$xy - y = 2x + 1$$

$$y(x-1) = 2x + 1$$

$$y = \frac{2x+1}{x-1}$$

REF: 081714aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: rational

467 ANS: 3 REF: 061720aai NAT: F.BF.A.2 TOP: Sequences

KEY: function notation

468 ANS: 1

(2) is not recursive

REF: 081608aai NAT: F.BF.A.2 TOP: Sequences KEY: recursive

469 ANS: 3 REF: 081819aai NAT: A.REI.D.11 TOP: Other Systems

KEY: logarithmic

470 ANS: 1 REF: 081722aai NAT: S.IC.B.6 TOP: Analysis of Data

KEY: draw conclusions

471 ANS: 4

If  $1 - i$  is one solution, the other is  $1 + i$ .  $(x - (1 - i))(x - (1 + i)) = 0$ 

$$x^2 - x - ix - x + ix + (1 - i^2) = 0$$

$$x^2 - 2x + 2 = 0$$

REF: 081601aai NAT: A.REI.B.4 TOP: Complex Conjugate Root Theorem

472 ANS: 1 REF: 081609aai NAT: F.BF.B.6 TOP: Sigma Notation

KEY: represent

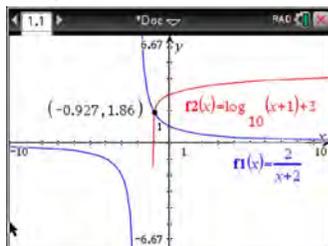
473 ANS: 2

$$\begin{array}{r}
 x^2 + 0x + 1 \\
 x + 2 \overline{) x^3 + 2x^2 + x + 6} \\
 \underline{x^3 + 2x^2} \phantom{+ x + 6} \\
 0x^2 + x \phantom{+ 6} \\
 \underline{0x^2 + 0x} \phantom{+ 6} \\
 x + 6 \\
 \underline{x + 2} \\
 4
 \end{array}$$

REF: 081611aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

474 ANS: 2



REF: 011712aii NAT: A.REI.D.11 TOP: Other Systems

KEY: rational

475 ANS: 1

II. Ninth graders drive to school less often; III. Students know little about adults; IV. Calculus students love math!

REF: 081602aii NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

476 ANS: 4

REF: 061706aii

NAT: F.IF.B.4

TOP: Graphing Trigonometric Functions

477 ANS: 3

$f(x) = -f(x)$ , so  $f(x)$  is odd.  $g(-x) \neq g(x)$ , so  $g(x)$  is not even.  $g(-x) \neq -g(x)$ , so  $g(x)$  is not odd.  $h(-x) = h(x)$ , so  $h(x)$  is even.

REF: fall1502aii NAT: F.BF.B.3 TOP: Even and Odd Functions

478 ANS: 1

$$d = 18; r = \pm \frac{5}{4}$$

REF: 011714aii NAT: F.BF.A.2 TOP: Sequences KEY: explicit

479 ANS: 2

$$(2 - yi)(2 - yi) = 4 - 4yi + y^2 i^2 = -y^2 - 4yi + 4$$

REF: 061603aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

480 ANS: 1

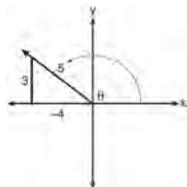
$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(2)}}{2(2)} = \frac{-3 \pm \sqrt{-7}}{4} = -\frac{3}{4} \pm \frac{i\sqrt{7}}{4}$$

REF: 061612aii NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

481 ANS: 3 REF: 061607aii NAT: S.IC.A.2 TOP: Analysis of Data

482 ANS: 1

A reference triangle can be sketched using the coordinates  $(-4, 3)$  in the second quadrant to find the value of  $\sin \theta$ .

REF: spr1503aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions

KEY: extension to reals

483 ANS: 3

$$\left(\frac{1}{2}\right)^{\frac{1}{73.83}} \approx 0.990656$$

REF: 081710aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

484 ANS: 3

$$0.75^{\frac{1}{10}} \approx .9716$$

REF: 061713aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

485 ANS: 4

$$\frac{n}{m} = \frac{\sqrt{a^5}}{a} = \frac{a^{\frac{5}{2}}}{a^{\frac{2}{2}}} = a^{\frac{3}{2}} = \sqrt{a^3}$$

REF: 011811aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

486 ANS: 4

$$k^4 - 4k^2 + 8k^3 - 32k + 12k^2 - 48$$

$$k^2(k^2 - 4) + 8k(k^2 - 4) + 12(k^2 - 4)$$

$$(k^2 - 4)(k^2 + 8k + 12)$$

$$(k + 2)(k - 2)(k + 6)(k + 2)$$

REF: fall1505aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

487 ANS: 3

(3) repeats 3 times over  $2\pi$ .

REF: 011722aai NAT: F.IF.C.7

TOP: Graphing Trigonometric Functions

KEY: recognize | bimodalgraph

488 ANS: 4

$$x(x+7) \left[ \frac{3x+25}{x+7} - 5 = \frac{3}{x} \right]$$

$$x(3x+25) - 5x(x+7) = 3(x+7)$$

$$3x^2 + 25x - 5x^2 - 35x = 3x + 21$$

$$2x^2 + 13x + 21 = 0$$

$$(2x+7)(x+3) = 0$$

$$x = -\frac{7}{2}, -3$$

REF: fall1501aai NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

489 ANS: 3

$$(m-2)^2(m+3) = (m^2 - 4m + 4)(m+3) = m^3 + 3m^2 - 4m^2 - 12m + 4m + 12 = m^3 - m^2 - 8m + 12$$

REF: 081605aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

490 ANS: 4

REF: 081707aai

NAT: F.TF.A.2

TOP: Reference Angles

KEY: bimodalgraph

491 ANS: 3



REF: 081604aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: probability

492 ANS: 4

$$496 \pm 2(115)$$

REF: 011718aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: interval

493 ANS: 2

The vertex of the parabola is  $(0,0)$ . The distance,  $p$ , between the vertex and the focus or the vertex and the

directrix is 1.  $y = \frac{-1}{4p}(x-h)^2 + k$

$$y = \frac{-1}{4(1)}(x-0)^2 + 0$$

$$y = -\frac{1}{4}x^2$$

REF: 081706aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

494 ANS: 1

$$\frac{2(x-4)}{(x+3)(x-4)} + \frac{3(x+3)}{(x-4)(x+3)} = \frac{2x-2}{x^2-x-12}$$

$$2x-8+3x+9 = 2x-2$$

$$3x = -3$$

$$x = -1$$

REF: 011717aii NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

495 ANS: 2

$$x = -\frac{3}{4}y + 2$$

$$-4x = 3y - 8$$

$$-4x + 8 = 3y$$

$$-\frac{4}{3}x + \frac{8}{3} = y$$

REF: 061616aii NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

496 ANS: 3

$$(3k-2i)^2 = 9k^2 - 12ki + 4i^2 = 9k^2 - 12ki - 4$$

REF: 081702aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

497 ANS: 4

$$\text{period} = \frac{2\pi}{B}$$

$$\frac{1}{60} = \frac{2\pi}{B}$$

$$B = 120\pi$$

REF: 061624aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

498 ANS: 3

$$\sqrt{56-x} = x \quad -8 \text{ is extraneous.}$$

$$56-x = x^2$$

$$0 = x^2 + x - 56$$

$$0 = (x+8)(x-7)$$

$$x = 7$$

REF: 061605aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

499 ANS: 1

$$\frac{2x}{x-2} \left( \frac{x}{x} \right) - \frac{11}{x} \left( \frac{x-2}{x-2} \right) = \frac{8}{x^2-2x}$$

$$2x^2 - 11x + 22 = 8$$

$$2x^2 - 11x + 14 = 0$$

$$(2x-7)(x-2) = 0$$

$$x = \frac{7}{2}, 2$$

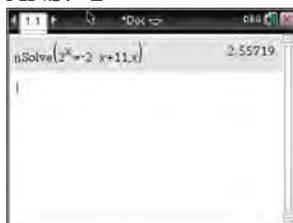
REF: 061719aai NAT: A.REI.A.2 TOP: Solving Rationals

500 ANS: 2

$$\begin{aligned} x(30-0.01x) - (0.15x^3 + 0.01x^2 + 2x + 120) &= 30x - 0.01x^2 - 0.15x^3 - 0.01x^2 - 2x - 120 \\ &= -0.15x^3 - 0.02x^2 + 28x - 120 \end{aligned}$$

REF: 061709aai NAT: F.BF.A.1 TOP: Operations with Functions

501 ANS: 2



REF: 081603aai NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

502 ANS: 1

$$P(28) = 5(2)^{\frac{98}{28}} \approx 56$$

REF: 011702aai NAT: F.LE.A.2 TOP: Modeling Exponential Functions

503 ANS: 3

$$x^2 + 2x + 1 = -5 + 1$$

$$(x + 1)^2 = -4$$

$$x + 1 = \pm 2i$$

$$x = -1 \pm 2i$$

REF: 081703aii NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | completing the square

504 ANS: 2

$$\cos \theta = \pm \sqrt{1 - \left(\frac{-\sqrt{2}}{5}\right)^2} = \pm \sqrt{\frac{25}{25} - \frac{2}{25}} = \pm \frac{\sqrt{23}}{5}$$

REF: 061712aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

505 ANS: 4

The maximum volume of  $p(x) = -(x + 2)(x - 10)(x - 14)$  is about 56, at  $x = 12.1$ 

REF: 081712aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

506 ANS: 1

REF: 081616aii NAT: F.TF.A.1 TOP: Unit Circle

KEY: bimodalgraph

507 ANS: 1

The car lost approximately 19% of its value each year.

REF: 081613aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

508 ANS: 2

REF: 061620aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

509 ANS: 3

Self selection causes bias.

REF: 061703aii NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

510 ANS: 2

REF: 081717aii NAT: S.IC.B.3 TOP: Analysis of Data

511 ANS: 1

$$(1) \frac{9-0}{2-1} = 9 \quad (2) \frac{17-0}{3.5-1} = 6.8 \quad (3) \frac{0-0}{5-1} = 0 \quad (4) \frac{17--5}{3.5-1} \approx 6.3$$

REF: 011724aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: graph

512 ANS: 2



$\bar{x} + 2\sigma$  represents approximately 48% of the data.

REF: 061609aia NAT: S.ID.A.4 TOP: Normal Distributions

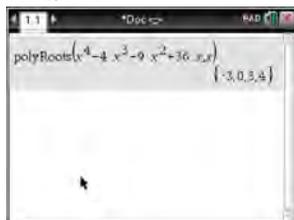
KEY: percent

513 ANS: 4

$$S_n = \frac{32 - 32(.8)^{12}}{1 - .8} \approx 149$$

REF: 081721aia NAT: F.BF.B.7 TOP: Series KEY: geometric

514 ANS: 1



$$x^4 - 4x^3 - 9x^2 + 36x = 0$$

$$x^3(x - 4) - 9x(x - 4) = 0$$

$$(x^3 - 9x)(x - 4) = 0$$

$$x(x^2 - 9)(x - 4) = 0$$

$$x(x + 3)(x - 3)(x - 4) = 0$$

$$x = 0, \pm 3, 4$$

REF: 061606aia NAT: A.APR.B.3 TOP: Solving Polynomial Equations

## Algebra II 2 Point Regents Exam Questions Answer Section

515 ANS:

No, because  $P(F / CR) \neq P(F)$ 

$$\frac{36}{42 + 36} \neq \frac{17 + 37 + 36 + 15}{39 + 17 + 42 + 12 + 17 + 37 + 36 + 15}$$

$$\frac{36}{78} \neq \frac{105}{215}$$

$$\frac{6}{13} \neq \frac{21}{43}$$

REF: 082231aii NAT: S.CP.A.4 TOP: Conditional Probability

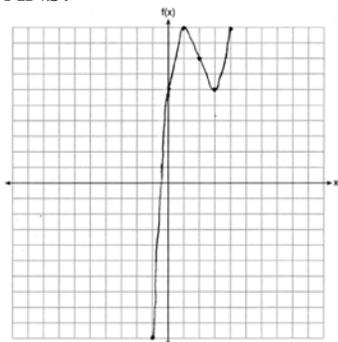
516 ANS:

period is  $\frac{2}{3}$ . The wheel rotates once every  $\frac{2}{3}$  second.

REF: 061728aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: period

517 ANS:



REF: 061826aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

518 ANS:

$$\frac{165 + 66 - 33}{825} = \frac{198}{825}$$

REF: 081925aii NAT: S.CP.B.7 TOP: Addition Rule

519 ANS:

$$xi(-6i)^2 = xi(36i^2) = 36xi^3 = -36xi$$

REF: 081627aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

520 ANS:

$$\frac{2\pi}{\frac{2\pi}{5}} = 5 \text{ The wheel rotates every 5 minutes.}$$

REF: 062429aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: period

521 ANS:

$$\sin^2 \theta + (-0.7)^2 = 1 \quad \text{Since } \theta \text{ is in Quadrant II, } \sin \theta = \sqrt{.51} \text{ and } \tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\sqrt{.51}}{-0.7} \approx -1.02$$

$$\sin^2 \theta = .51$$

$$\sin \theta = \pm \sqrt{.51}$$

REF: 081628aai NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

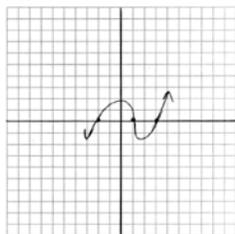
522 ANS:

$$\frac{10.1 - -2}{2} - \frac{2.5 - -0.1}{2} = 6.05 - 1.3 = 4.75$$

REF: 081930aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: amplitude

523 ANS:



REF: 011729aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

524 ANS:

Amplitude, because the height of the graph shows the volume of the air.

REF: 081625aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: mixed

525 ANS:

$$3(x^3 + 4x^2 - x - 4) = 0$$

$$(x^2(x+4) - (x+4)) = 0$$

$$(x^2 - 1)(x+4) = 0$$

$$x = \pm 1, -4$$

REF: 012325aai NAT: A.APR.B.3 TOP: Solving Polynomial Equations

526 ANS:

$$x^3 + 4x^2 - 9x - 36 = x^2(x+4) - 9(x+4) = (x^2 - 9)(x+4) = (x+3)(x-3)(x+4)$$

REF: 012425aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

527 ANS:

$$\frac{V(7) - V(2)}{7 - 2} \approx 48$$

REF: 012427aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: exponential

528 ANS:

$$a^{x+1} = a^{\frac{2}{3}}$$

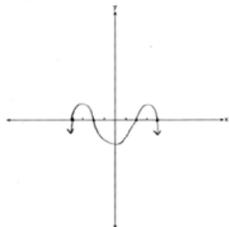
$$x + 1 = \frac{2}{3}$$

$$x = -\frac{1}{3}$$

REF: 012326aii NAT: F.LE.A.4 TOP: Exponential Equations

KEY: common base shown

529 ANS:



REF: 011926aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

530 ANS:

$$i^2 = -1, \text{ and not } 1; 10 + 10i$$

REF: 011825aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

531 ANS:

$$-6(x+3)\left(\frac{-3}{x+3} - \frac{x}{6} + 1 = 0\right)$$

$$18 + x(x+3) - 6(x+3) = 0$$

$$18 + x^2 + 3x - 6x - 18 = 0$$

$$x^2 - 3x = 0$$

$$x(x-3) = 0$$

$$x = 0, 3$$

REF: 081829aai NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

532 ANS:

Yes. Using a 95% confidence interval, values outside the interval 3.95 – 4.05 are unusual.

REF: 012532aai NAT: S.IC.A.2 TOP: Analysis of Data

533 ANS:

$$g(3) = 0; \quad 0 = 3^3 + a(3)^2 - 5(3) + 6$$

$$0 = 27 + 9a - 15 + 6$$

$$-18 = 9a$$

$$a = -2$$

REF: 062328aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

534 ANS:

 $P(A \cup B) = P(A) + P(B) - P(A \cap B)$   $A$  and  $B$  are independent since  $P(A \cap B) = P(A) \cdot P(B)$ 

$$0.8 = 0.6 + 0.5 - P(A \cap B)$$

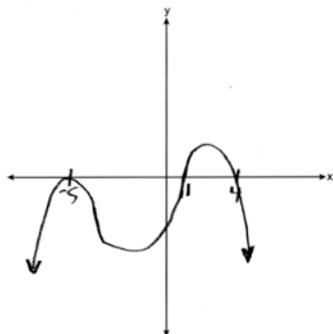
$$0.3 = 0.6 \cdot 0.5$$

$$P(A \cap B) = 0.3$$

$$0.3 = 0.3$$

REF: 081632aai NAT: S.CP.B.7 TOP: Addition Rule

535 ANS:



REF: 062428aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

536 ANS:

$$(5xi^3 - 4i)^2 = (-5xi - 4i)^2 = 25x^2i^2 + 40xi^2 + 16i^2 = -25x^2 - 40x - 16$$

REF: 082329aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

537 ANS:

$$x^2 + (x - 28)^2 = 400 \quad y = 12 - 28 = -16 \quad y = 16 - 28 = -12$$

$$x^2 + x^2 - 56x + 784 = 400$$

$$2x^2 - 56x + 384 = 0$$

$$x^2 - 28x + 192 = 0$$

$$(x - 16)(x - 12) = 0$$

$$x = 12, 16$$

REF: 081831aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

538 ANS:

$$a_1 = 12$$

$$a_n = a_{n-1} + 6$$

REF: 012430aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive

539 ANS:

$$\ln e^{0.49x} = \ln 7.5$$

$$0.49x = \ln 7.5$$

$$x = \frac{\ln 7.5}{0.49} \approx 4.112$$

REF: 062330aii NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

540 ANS:

Since there are six flavors, each flavor can be assigned a number, 1-6. Use the simulation to see the number of times the same number is rolled 4 times in a row.

REF: 081728aii NAT: S.IC.A.2 TOP: Analysis of Data

541 ANS:

$$a_1 = 4 \quad a_8 = 639$$

$$a_n = 2a_{n-1} + 1$$

REF: 081729aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive

542 ANS:

$$\frac{P(10.5) - P(0)}{10.5 - 0} \approx 10.76 \text{ fruit flies per day}$$

REF: 082332aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: exponential

543 ANS:

$P(-2) = 60$   $Q(-2) = 0$   $(x + 2)$  is a factor of  $Q(x)$  since  $Q(-2) = 0$ .

REF: 081929aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

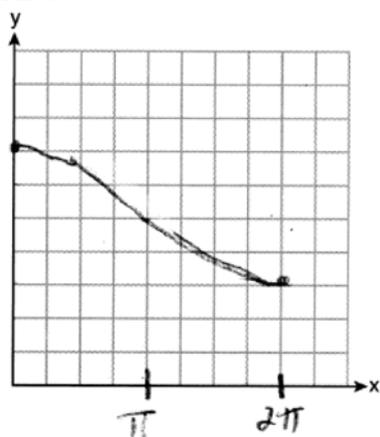
544 ANS:

$$\sqrt[3]{81} = \sqrt[3]{3^4} = 3^{\frac{4}{3}} \quad a = \frac{4}{3}$$

REF: 062230aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

545 ANS:



REF: 062231aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

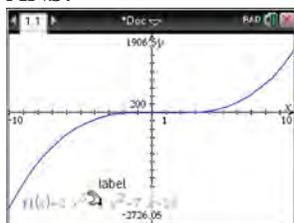
KEY: graph

546 ANS:

The denominator of the rational exponent represents the index of a root, and the 4th root of 81 is 3 and  $3^3$  is 27.

REF: 011832aai NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

547 ANS:

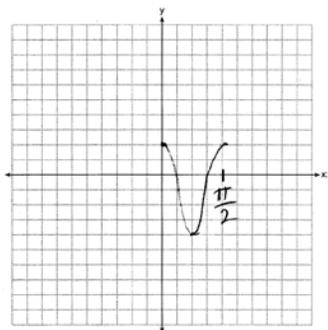


$$x - 5 \overline{) 2x^3 - 4x^2 - 7x - 10} \quad \text{Since there is a remainder, } x - 5 \text{ is not a factor.}$$

$$\begin{array}{r} 2x^3 - 10x^2 \\ \underline{6x^2 - 7x} \\ 6x^2 - 30x \\ \underline{23x - 10} \\ 23x - 115 \\ \underline{105} \end{array}$$

REF: 061627aia NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

548 ANS:

REF: 061628aia NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions  
KEY: graph

549 ANS:

$$\text{No. } \left(\sqrt[7]{x^2}\right)\left(\sqrt[5]{x^3}\right) = x^{\frac{2}{7}} \cdot x^{\frac{3}{5}} = x^{\frac{31}{35}} = \sqrt[35]{x^{31}}$$

REF: 061929aia NAT: N.RN.A.2 TOP: Radicals and Rational Exponents  
KEY: variables

550 ANS:

$$-x(2x^3 - x^2 - 18x + 9)$$

$$-x(x^2(2x - 1) - 9(2x - 1))$$

$$-x(x^2 - 9)(2x - 1)$$

$$-x(x + 3)(x - 3)(2x - 1)$$

REF: 062228aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

551 ANS:

$$C(t) = 130(0.5)^{\frac{t}{5.5}}$$

REF: 082430aai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

552 ANS:

The denominator of the rational exponent represents the index of a root, and the numerator of the rational exponent represents the power of the base.  $(\sqrt{9})^5 = 243$

REF: 081926aai NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

553 ANS:

$$j(-x) = (-x)^4 - 3(-x)^2 - 4 = x^2 - 3x^2 - 4 \text{ Since } j(x) = j(-x), \text{ the function is even.}$$

REF: 081731aai NAT: F.BF.B.3 TOP: Even and Odd Functions

554 ANS:

$$\text{Julia: } V(x) = 33,400(0.85^{\frac{1}{12}})^{12x} \approx 33,400(0.9865)^{12x}$$

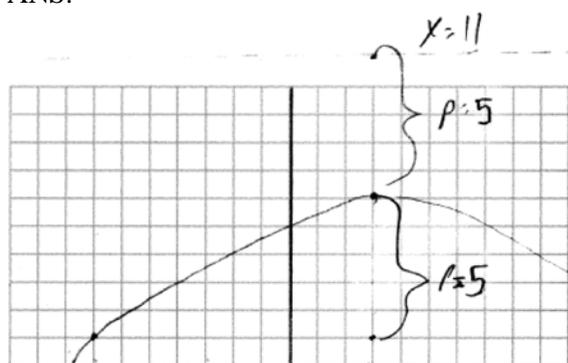
REF: 012530aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

555 ANS:

Rewrite  $\frac{4}{3}$  as  $\frac{1}{3} \cdot \frac{4}{1}$ , using the power of a power rule.

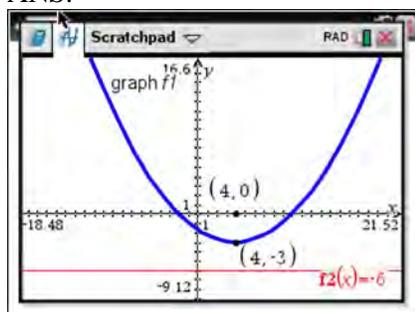
REF: 081725aai NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

556 ANS:

vertex (3, 6), focus (3, 1),  $p = 5$ , directrix  $y = 6 + 5 = 11$ 

REF: 012028aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

557 ANS:



The vertex of the parabola is (4, -3). The x-coordinate of the focus and the vertex is the same. Since the distance from the vertex to the directrix is 3, the distance from the vertex to the focus is 3, so the y-coordinate of the focus is 0. The coordinates of the focus are (4, 0).

REF: 061630aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

558 ANS:

$$\frac{\frac{8}{3}}{\frac{4}{3}} = x^y$$

$$x^{\frac{4}{3}} = x^y$$

$$\frac{4}{3} = y$$

REF: spr1505aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: numbers

559 ANS:

$$x = \frac{-3 \pm \sqrt{3^2 - 4(1)(11)}}{2(1)} = \frac{-3 \pm \sqrt{-35}}{2} = \frac{3}{2} \pm \frac{i\sqrt{35}}{2}$$

REF: 082432aai NAT: A.REI.B.4 TOP: Solving Quadratics

560 ANS:

$$a_1 = 4$$

$$a_n = 3a_{n-1}$$

REF: 081931aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive

561 ANS:

$$\begin{array}{r} \phantom{x-2} \overline{3x+13} \\ x-2 \overline{) 3x^2+7x-20} \phantom{3x+13} + \frac{6}{x-2} \\ \underline{3x^2-6x} \phantom{-20} \\ 13x-20 \\ \underline{13x-26} \\ 6 \end{array}$$

REF: 011732aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

562 ANS:

$$3x+7 = x^2 - 2x + 1 \quad -1 \text{ is extraneous.}$$

$$0 = x^2 - 5x - 6$$

$$0 = (x-6)(x+1)$$

$$x = 6, -1$$

REF: 062326aii NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

563 ANS:

$$\left( \frac{x^{\frac{5}{3}}}{x^{\frac{5}{3}}} \right)^{\frac{6}{5}} = \left( y^{\frac{5}{6}} \right)^{\frac{6}{5}}$$

$$x^2 = y$$

REF: 011730aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

564 ANS:

$$x = \frac{-5 \pm \sqrt{5^2 - 4(2)(8)}}{2(2)} = -\frac{5}{4} \pm \frac{i\sqrt{39}}{4}$$

REF: 061827aii NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

565 ANS:

$$F(t) = 169.136(.971)^t$$

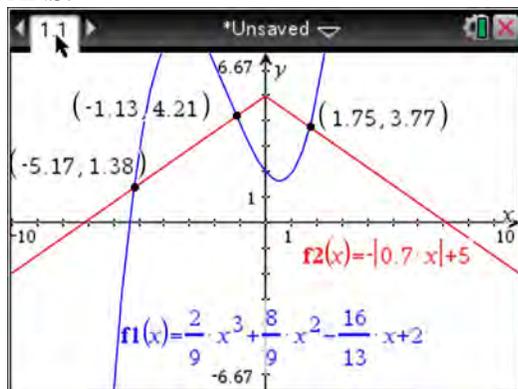
REF: 062232aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

566 ANS:

No.  $0.499 \pm 2(0.049) \rightarrow 0.401 - 0.597$ . Since 0.43 falls within this interval, Robin's coin is likely not unfair.

REF: 061932aii NAT: S.IC.A.2 TOP: Analysis of Data

567 ANS:



REF: fall1510aii NAT: A.REI.D.11 TOP: Other Systems

KEY: polynomial

568 ANS:

$$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$$

$$\frac{7x+7-4x}{2x^2+2x} = \frac{1}{4}$$

$$2x^2 + 2x = 12x + 28$$

$$x^2 - 5x - 14 = 0$$

$$(x-7)(x+2) = 0$$

$$x = 7, -2$$

REF: 061926aii NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

569 ANS:

$$2x^3 - 3x^2 - 18x + 27$$

$$x^2(2x-3) - 9(2x-3)$$

$$(x^2-9)(2x-3)$$

$$(x+3)(x-3)(2x-3)$$

REF: 082325aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

570 ANS:

No, because a  $180^\circ$  rotation of  $f$  about the origin does not map  $f$  onto itself.

REF: 062432aai NAT: F.BF.B.3 TOP: Even and Odd Functions

571 ANS:

$$2x^2 - 7x + 4 = 11 - 2x \quad y = 11 - 2\left(\frac{7}{2}\right) = 4 \quad \left\{\left(\frac{7}{2}, 4\right), (-1, 13)\right\}$$

$$2x^2 - 5x - 7 = 0 \quad y = 11 - 2(-1) = 13$$

$$(2x - 7)(x + 1) = 0$$

$$x = \frac{7}{2}, -1$$

REF: 082232aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

572 ANS:

$$r = \frac{360}{300} = 1.2 \quad S_n = \frac{300 - 300(1.2)^n}{1 - 1.2} \quad S_{10} = \frac{300 - 300(1.2)^{10}}{1 - 1.2} \approx 7787.6$$

REF: 012029aai NAT: F.BF.B.7 TOP: Series KEY: geometric

573 ANS:

$$x = (y - 3)^3 + 1$$

$$x - 1 = (y - 3)^3$$

$$\sqrt[3]{x - 1} = y - 3$$

$$\sqrt[3]{x - 1} + 3 = y$$

$$f^{-1}(x) = \sqrt[3]{x - 1} + 3$$

REF: fall1509aai NAT: F.BF.B.4 TOP: Inverse of Functions  
KEY: cubic

574 ANS:

$$20e^{.05t} = 30e^{.03t}$$

$$\frac{\frac{2}{3}e^{.05t}}{e^{.05t}} = \frac{e^{.03t}}{e^{.05t}}$$

$$\ln \frac{2}{3} = \ln e^{-.02t}$$

$$\ln \frac{2}{3} = -.02t \ln e$$

$$\frac{\ln \frac{2}{3}}{-.02} = t$$

$$20.3 \approx t$$

REF: 011829aai NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

575 ANS:

$$0 < e^{\frac{\left(\ln \frac{1}{2}\right)}{1590}} < 1, \text{ so } M(t) \text{ represents decay.}$$

REF: 011728aai NAT: F.IF.C.7 TOP: Graphing Exponential Functions

576 ANS:

$$1200 \cdot 0.784 \approx 941$$

REF: 081828aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: predict

577 ANS:

A student is more likely to jog if both siblings jog. 1 jogs:  $\frac{416}{2239} \approx 0.19$ . both jog:  $\frac{400}{1780} \approx 0.22$

REF: 061732aai NAT: S.CP.A.4 TOP: Conditional Probability

578 ANS:

$$S_{10} = \frac{15 - 15(1.03)^{10}}{1 - 1.03} \approx 171.958$$

REF: 011929aai NAT: F.BF.B.7 TOP: Series KEY: geometric

579 ANS:

$$M = \frac{(152500 - 15250) \left( \frac{.036}{12} \right) \left( 1 + \frac{.036}{12} \right)^{360}}{\left( 1 + \frac{.036}{12} \right)^{360} - 1} \approx 624$$

REF: 061831aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

580 ANS:

left 3, down 5

REF: 012525aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

581 ANS:

$$x^2(4x - 1) + 4(4x - 1) = (x^2 + 4)(4x - 1)$$

REF: 061727aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

582 ANS:

$$\frac{8x - 3(x + 5)}{x(x + 5)} = 5$$

$$8x - 3x - 15 = 5x^2 + 25x$$

$$0 = 5x^2 + 20x + 15$$

$$0 = x^2 + 4x + 3$$

$$0 = (x + 3)(x + 1)$$

$$x = -3, -1$$

REF: 062430aii NAT: A.REI.A.2 TOP: Solving Rationals

583 ANS:

Randomly assign participants to two groups. One group uses the toothpaste with ingredient X and the other group uses the toothpaste without ingredient X.

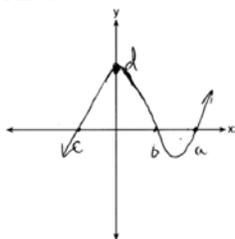
REF: 061626aii NAT: S.IC.B.3 TOP: Analysis of Data

584 ANS:

$$-\frac{1}{2}i^3(3i - 4) - 3i^2 = -\frac{3}{2}i^4 + 2i^3 - 3i^2 = -\frac{3}{2} - 2i + 3 = \frac{3}{2} - 2i$$

REF: 081927aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

585 ANS:



REF: 081732aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

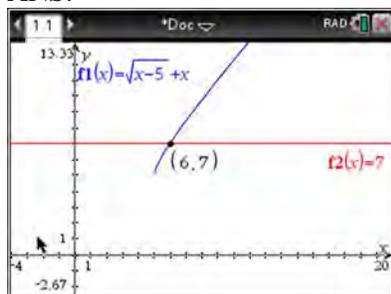
586 ANS:

$$0.133696 \times 9256 \approx 1237$$

REF: 082230aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: predict

587 ANS:



$$\sqrt{x-5} = -x+7 \quad \sqrt{x-5} = -9+7 = -2 \text{ is extraneous.}$$

$$x-5 = x^2 - 14x + 49$$

$$0 = x^2 - 15x + 54$$

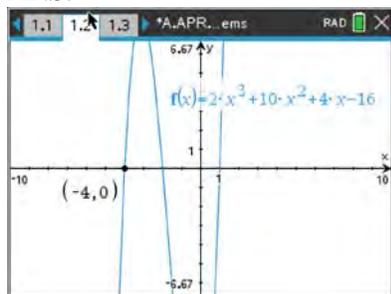
$$0 = (x-6)(x-9)$$

$$x = 6, 9$$

REF: spr1508aai NAT: A.REI.A.2 TOP: Solving Radicals

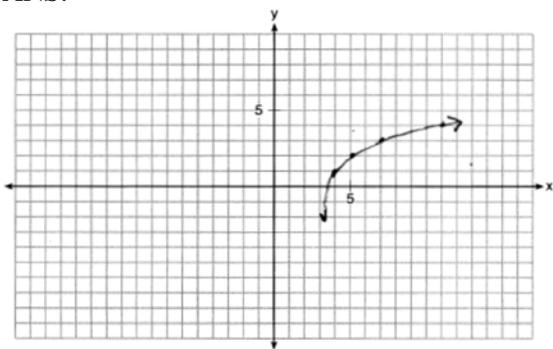
KEY: extraneous solutions

588 ANS:

Since  $-4$  is a zero,  $x+4$  is a factor.

REF: 012426aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

589 ANS:



REF: 011932aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

590 ANS:

$$D = 1.223(2.652)^A$$

REF: 011826aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

591 ANS:

$$\frac{306.25 - 156.25}{70 - 50} = \frac{150}{20} = 7.5 \text{ Between 50-70 mph, each additional mph in speed requires 7.5 more feet to stop.}$$

REF: 081631aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: table

592 ANS:

$$\frac{20}{8} = 2.5 \quad a_1 = 8$$

$$a_n = 2.5 \cdot a_{n-1}$$

REF: 012531aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive

593 ANS:

$$3x^3 + x^2 + 3xy + y = x^2(3x + 1) + y(3x + 1) = (x^2 + y)(3x + 1)$$

REF: 011828aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

594 ANS:

$$x^2 + 8x - 5 = 8x - 4$$

$$x^2 - 1 = 0$$

$$x = \pm 1$$

REF: 082326aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

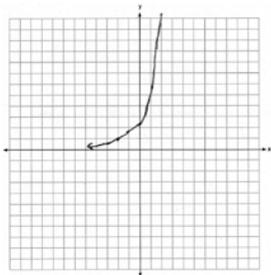
595 ANS:

$$\frac{x^2(2x+1) - 9(2x+1)}{x(3-x)} = \frac{(x^2-9)(2x+1)}{x(3-x)} = \frac{(x+3)(x-3)(2x+1)}{x(3-x)} = \frac{(x+3)(2x+1)}{-x}$$

REF: 062331ai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

596 ANS:



REF: 082425aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

597 ANS:

$$\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}} = \frac{x^{\frac{2}{3}}y^{\frac{5}{3}}}{x^{\frac{3}{4}}y^{\frac{12}{4}}} = \frac{x^{\frac{8}{12}}y^{\frac{20}{12}}}{x^{\frac{9}{12}}y^{\frac{12}{12}}} = x^{-\frac{1}{12}}y^{\frac{2}{3}}$$

REF: 011925aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

598 ANS:

$$(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$$

$$x^4 + 2x^2y^2 + y^4 = x^4 - 2x^2y^2 + y^4 + 4x^2y^2$$

$$x^4 + 2x^2y^2 + y^4 = x^4 + 2x^2y^2 + y^4$$

REF: 081727aii NAT: A.APR.C.4 TOP: Polynomial Identities

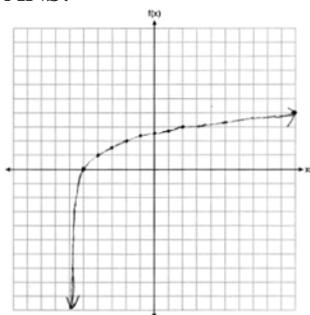
599 ANS:

$$\frac{p(8) - p(4)}{8 - 4} \approx 48.78$$

REF: 081827aii NAT: F.IF.B.6 TOP: Rate of Change

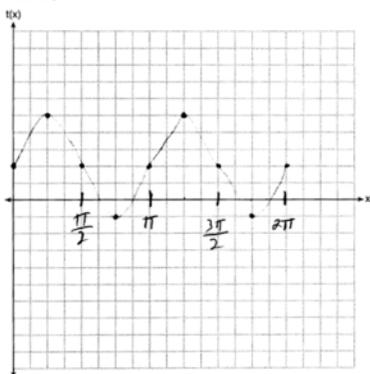
KEY: exponential

600 ANS:



REF: 061927aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

601 ANS:



REF: 081830aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: graph

602 ANS:

$$\frac{1}{x} - \frac{1}{3} = -\frac{1}{3x}$$

$$\frac{3-x}{3x} = -\frac{1}{3x}$$

$$3-x = -1$$

$$x = 4$$

REF: 061625aai NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

603 ANS:

The expression is of the form  $y^2 - 5y - 6$  or  $(y - 6)(y + 1)$ . Let  $y = 4x^2 + 5x$ :

$$(4x^2 + 5x - 6)(4x^2 + 5x + 1)$$

$$(4x - 3)(x + 2)(4x + 1)(x + 1)$$

REF: fall1512aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY:  $a > 1$

604 ANS:

$$\frac{x \cdot x^{\frac{3}{2}}}{x^{\frac{5}{3}}} = \frac{x^{\frac{6}{6}} \cdot x^{\frac{9}{6}}}{x^{\frac{10}{6}}} = x^{\frac{5}{6}}$$

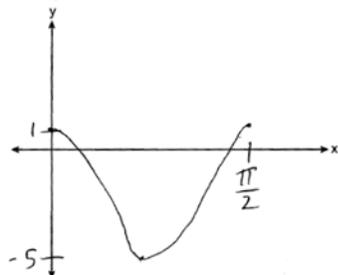
REF: 082331aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

605 ANS:

$$\frac{1}{3} \times \frac{5}{12} = \frac{5}{36}$$

REF: 012327aii NAT: S.CP.A.2 TOP: Probability of Compound Events

606 ANS:



REF: 082328aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: graph

607 ANS:

$$\frac{x^3 + 9}{x^3 + 8} = \frac{x^3 + 8}{x^3 + 8} + \frac{1}{x^3 + 8}$$

$$\frac{x^3 + 9}{x^3 + 8} = \frac{x^3 + 9}{x^3 + 8}$$

REF: 061631aii NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

608 ANS:

Let  $x$  equal the first integer and  $x + 1$  equal the next.  $(x + 1)^2 - x^2 = x^2 + 2x + 1 - x^2 = 2x + 1$ .  $2x + 1$  is an odd integer.

REF: fall1511aii NAT: A.APR.C.4 TOP: Polynomial Identities

609 ANS:

$$\left(p^2 n^{\frac{1}{2}}\right)^8 \sqrt{p^5 n^4} = \left(p^{16} n^4\right) p^2 n^2 \sqrt{p} = p^{18} n^6 \sqrt{p}$$

REF: 012025aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

610 ANS:

$$\frac{63}{189} = \frac{1}{3} a_1 = 189$$

$$a_n = \frac{1}{3} a_{n-1}$$

REF: 062329aai NAT: F.BF.A.2 TOP: Sequences KEY: recursive

611 ANS:

$$x^3 - 2x^2 - 9x + 18 = x^2(x-2) - 9(x-2) = (x^2 - 9)(x-2) = (x+3)(x-3)(x-2)$$

REF: 082226aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

612 ANS:

$$\sqrt{x-4} = -x+6 \quad \sqrt{x-4} = -8+6 = -2 \text{ is extraneous.}$$

$$x-4 = x^2 - 12x + 36$$

$$0 = x^2 - 13x + 40$$

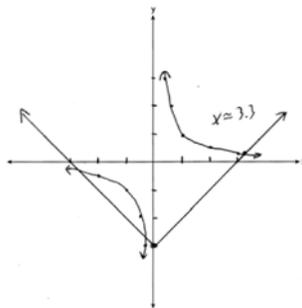
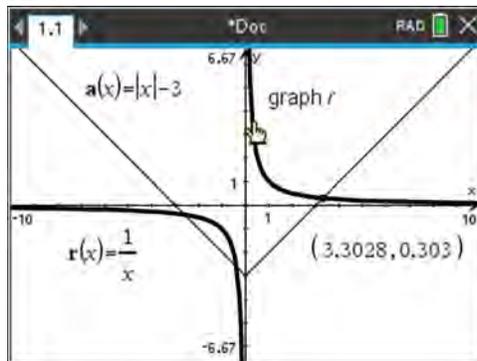
$$0 = (x-8)(x-5)$$

$$x = 5, 8$$

REF: 061730aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

613 ANS:



REF: 081932aai NAT: A.REI.D.11 TOP: Other Systems

KEY: rational

614 ANS:

sample: pails of oranges; population: truckload of oranges. It is likely that about 5% of all the oranges are unsatisfactory.

REF: 011726aai NAT: S.IC.B.6 TOP: Analysis of Data

KEY: draw conclusions

615 ANS:

$$t^2 + \left(\frac{4}{7}\right)^2 = 1 \quad -\frac{\sqrt{33}}{7}$$

$$t^2 + \frac{16}{49} = \frac{49}{49}$$

$$t^2 = \frac{33}{49}$$

$$t = \frac{\pm\sqrt{33}}{7}$$

REF: 011931aii NAT: F.TF.A.2 TOP: Unit Circle

616 ANS:

$$\frac{13.9 - 9.4}{4 - 1} = 1.5 \quad \text{The average rate of change in the number of hours of daylight from January 1-April 1 is 1.5.}$$

REF: 061925aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: trigonometric

617 ANS:

Self selection is a cause of bias because people with more free time are more likely to respond.

REF: 061828aii NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

618 ANS:

$$(x^2 - 6)(x^2 + 2)$$

REF: 081825aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: higher power

619 ANS:

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{-7/25}{-24/25} \quad \cos \theta = \frac{-24}{25}$$

REF: 061928aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

620 ANS:

$$B(t) = 100(2)^{\frac{t}{30}}$$

REF: 012031aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

621 ANS:

$\pi < \theta < 2\pi \rightarrow$  Quadrant III or IV  $\theta$  must be in Quadrant IV, where  $\tan \theta$  is negative.

$$\cos \theta = \frac{\sqrt{3}}{4} \rightarrow \text{Quadrant I or IV}$$

REF: 012332aii NAT: F.TF.A.2 TOP: Finding the Terminal Side of an Angle

622 ANS:

$$\cos A = \frac{\cos A}{\sin A}$$

$$-3 = \frac{3}{\sin A}$$

$$\sin A = \frac{3}{-3\sqrt{10}} = -\frac{1}{\sqrt{10}}$$

REF: 082229aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

623 ANS:

$$\left( \frac{1}{\sqrt[3]{y^2}} \right) y^4 = \frac{y^{\frac{12}{3}}}{y^{\frac{2}{3}}} = y^{\frac{10}{3}} \quad n = \frac{10}{3}$$

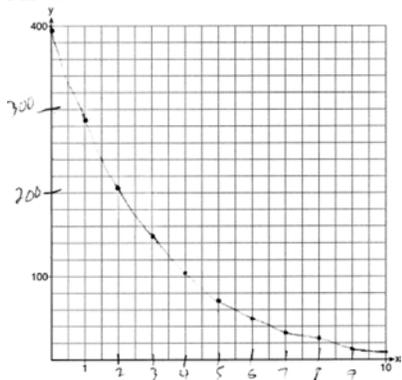
REF: 012428aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

624 ANS:

No.  $0.852 \pm 2(0.029) \rightarrow 0.794 - 0.91$ . 0.88 falls within this interval.

REF: 062332aii NAT: S.IC.A.2 TOP: Analysis of Data

625 ANS:



REF: 061729aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

626 ANS:

$$(a + b)^3 = a^3 + b^3 \quad \text{No. Erin's shortcut only works if } a = 0, b = 0 \text{ or } a = -b.$$

$$a^3 + 3a^2b + 3ab^2 + b^3 = a^3 + b^3$$

$$3ab^2 + 3a^2b = 0$$

$$3ab(b + a) = 0$$

$$a = 0, b = 0, a = -b$$

REF: 011927aii NAT: A.APR.C.4 TOP: Polynomial Identities

627 ANS:



69

REF: 061726aii NAT: S.ID.A.4 TOP: Normal Distributions

KEY: percent

628 ANS:

$r(2) = -6$ . Since there is a remainder when the cubic is divided by  $x - 2$ , this binomial is not a factor.

$$\begin{array}{r|rrrr} 2 & 1 & -4 & 4 & 6 \\ & & 2 & -4 & 0 \\ \hline & 1 & -2 & 0 & -6 \end{array}$$

REF: 061725aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

629 ANS:

No, because  $P(M/R) \neq P(M)$

$$\frac{70}{180} \neq \frac{230}{490}$$

$$0.38 \neq 0.47$$

REF: 011731aii NAT: S.CP.A.4 TOP: Conditional Probability

630 ANS:

Based on these data, the two events do not appear to be independent.  $P(J) = \frac{145}{277} = 0.52$ , while

$P(J|D) = \frac{58}{139} = 0.42$ . The probability of being a junior is not the same as the conditional probability of being a junior, given the junior drives to school.

REF: 062431aii NAT: S.CP.A.4 TOP: Conditional Probability

631 ANS:

$$y = 2.459(1.616)^x$$

REF: 012329aai NAT: S.ID.B.6 TOP: Regression KEY: exponential

632 ANS:

$$P(A+B) = P(A) \cdot P(B|A) = 0.8 \cdot 0.85 = 0.68$$

REF: 011928aai NAT: S.CP.A.3 TOP: Conditional Probability

633 ANS:

$$2(-1) + 5 = 3$$

REF: 082429aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

634 ANS:

$$x^4 - 5x^2 + 4$$

$$(x^2 - 4)(x^2 - 1)$$

$$(x+2)(x-2)(x+1)(x-1)$$

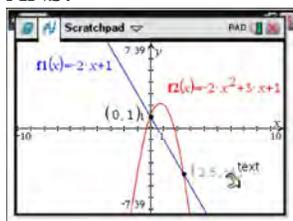
REF: 012331aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

635 ANS:



REF: 082428aai NAT: S.ID.A.4 TOP: Normal Distributions

636 ANS:



$$-2x + 1 = -2x^2 + 3x + 1$$

$$2x^2 - 5x = 0$$

$$x(2x - 5) = 0$$

$$x = 0, \frac{5}{2}$$

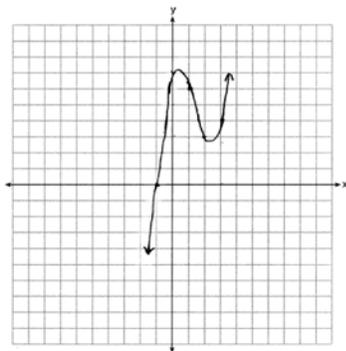
REF: fall1507aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

637 ANS:

$2(0.042) = 0.084 \approx 0.08$  The percent of users making in-app purchases will be within 8% of 35%.

REF: 081832aai NAT: S.IC.A.2 TOP: Analysis of Data

638 ANS:



REF: 012032aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

639 ANS:

$$(4 - 3i)(5 + 2yi - 5 + 2yi)$$

$$(4 - 3i)(4yi)$$

$$16yi - 12yi^2$$

$$12y + 16yi$$

REF: spr1506aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

640 ANS:

Since there is no remainder when the cubic is divided by  $x + 3$ , this binomial is a factor.

$$\begin{array}{r|rrrr} -3 & 7 & 27 & 9 & -27 \\ & & -21 & -18 & 27 \\ \hline & 7 & 6 & -9 & 0 \end{array}$$

REF: 082426aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

641 ANS:

$$\left(-\frac{2}{7}\right)^2 + \sin^2 \theta = 1 \quad \frac{3\sqrt{5}}{7} \text{ as } \sin \text{ is positive in Quadrant II.}$$

$$\frac{4}{49} + \sin^2 \theta = \frac{49}{49}$$

$$\sin^2 \theta = \frac{45}{49}$$

$$\sin \theta = \pm \frac{3\sqrt{5}}{7}$$

REF: 012527aai NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

642 ANS:

$$\frac{3}{n} = \frac{2}{n^2} \quad 0 \text{ is an extraneous solution.}$$

$$3n^2 = 2n$$

$$3n^2 - 2n = 0$$

$$n(3n - 2) = 0$$

$$n = 0, \frac{2}{3}$$

REF: 062227aii NAT: A.REI.A.2 TOP: Solving Rationals

643 ANS:

$$(x^3 + 2x - 1)(x^2 + 7) - 3(x^4 - 5x)$$

$$x^5 + 7x^3 + 2x^3 + 14x - x^2 - 7 - 3x^4 + 15x$$

$$x^5 - 3x^4 + 9x^3 - x^2 + 29x - 7$$

REF: 012330aii NAT: F.BF.A.1 TOP: Operations with Functions

644 ANS:

Light wave C. The periods for A, B, and C are 280, 220 and 320.

REF: 012030aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: period

645 ANS:

Yes.  $P(BI) = P(BI|GI)$ 

$$0.14 + 0.26 = \frac{.14}{.35}$$

$$.4 = .4$$

REF: 062229aii NAT: S.CP.A.4 TOP: Conditional Probability

646 ANS:

$$\frac{103}{110 + 103} = \frac{103}{213}$$

REF: 061825aii NAT: S.CP.A.4 TOP: Conditional Probability

647 ANS:

Applying the commutative property,  $\left(3^{\frac{1}{5}}\right)^2$  can be rewritten as  $\left(3^2\right)^{\frac{1}{5}}$  or  $9^{\frac{1}{5}}$ . A fractional exponent can be

rewritten as a radical with the denominator as the index, or  $9^{\frac{1}{5}} = \sqrt[5]{9}$ .

REF: 081626aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

648 ANS:

$$\sqrt[3]{x} \cdot \sqrt{x} = x^{\frac{1}{3}} \cdot x^{\frac{1}{2}} = x^{\frac{2}{6}} \cdot x^{\frac{3}{6}} = x^{\frac{5}{6}}$$

REF: 061731aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

649 ANS:

$$3x - 2x^2i + 6i - 4xi^2 + 2x^2i = 3x + 6i + 4x = 7x + 6i$$

REF: 062425aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

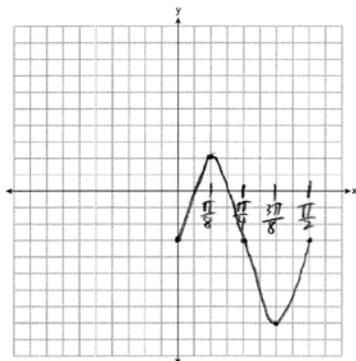
650 ANS:

Based on these data, the two events do not appear to be independent.  $P(F) = \frac{106}{200} = 0.53$ , while

$P(F|T) = \frac{54}{90} = 0.6$ ,  $P(F|R) = \frac{25}{65} = 0.39$ , and  $P(F|C) = \frac{27}{45} = 0.6$ . The probability of being female are not the same as the conditional probabilities. This suggests that the events are not independent.

REF: fall1508aii NAT: S.CP.A.4 TOP: Conditional Probability

651 ANS:



REF: 012529aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: graph

652 ANS:

$$\begin{array}{r} 2a^2 + 5a + 2 \\ 3a - 2 \overline{) 6a^3 + 11a^2 - 4a - 9} \quad 2a^2 + 5a + 2 - \frac{5}{3a - 2} \\ \underline{6a^3 - 4a^2} \phantom{- 9} \\ 15a^2 - 4a \phantom{- 9} \\ \underline{15a^2 - 10a} \phantom{- 9} \\ 6a - 9 \\ \underline{6a - 4} \\ -5 \end{array}$$

REF: 061829aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

653 ANS:

$$\frac{-1}{\sqrt{2^2 + (-1)^2}} = -\frac{1}{\sqrt{5}}$$

REF: 061832aai NAT: F.TF.A.2 TOP: Determining Trigonometric Functions

KEY: extension to reals

654 ANS:

$$\sqrt{4x+1} = 11-x \quad 20 \text{ is extraneous.}$$

$$4x+1 = 121 - 22x + x^2$$

$$0 = x^2 - 26x + 120$$

$$0 = (x-6)(x-20)$$

$$x = 6, 20$$

REF: 082227aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

655 ANS:



25

REF: 012429aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: percent

656 ANS:

$p$  is the distance from the focus to the vertex:  $8-7=1$ .  $p$  is the distance from the directrix to the vertex:

$$1 = 7 - d. \quad y = 6$$

$$d = 6$$

REF: 082330aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

657 ANS:

Using a 95% level of confidence,  $x \pm 2$  standard deviations sets the usual wait time as 150-302 seconds. 360 seconds is unusual.

REF: 081629aai NAT: S.IC.B.6 TOP: Analysis of Data

KEY: draw conclusions

658 ANS:

$$(1-i)(1-i)(1-i) = (1-2i+i^2)(1-i) = -2i(1-i) = -2i+2i^2 = -2-2i$$

REF: 011725aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

659 ANS:

$$4\% \quad 8.75 = 1.25(1+r)^{49} \text{ or } 8.75 = 1.25e^{49r}$$

$$7 = (1+r)^{49} \quad \ln 7 = \ln e^{49r}$$

$$r+1 = \sqrt[49]{7} \quad \ln 7 = 49r$$

$$r \approx .04 \quad r = \frac{\ln 7}{49}$$

$$r \approx .04$$

REF: 081730aai NAT: F.LE.A.4 TOP: Exponential Growth

660 ANS:

$0 = \log_{10}(x-4)$  The  $x$ -intercept of  $h$  is  $(2,0)$ .  $f$  has the larger value.

$$10^0 = x - 4$$

$$1 = x - 4$$

$$x = 5$$

REF: 081630aai NAT: F.IF.C.9 TOP: Comparing Functions

661 ANS:

$$\frac{55}{t} = \frac{65}{t+3}$$

$$65t = 55t + 165$$

$$10t = 165$$

$$t = 16.5$$

$$t+3 = 19.5$$

REF: 082431aai NAT: A.CED.A.1 TOP: Modeling Rationals

662 ANS:

The opinion sought is that of the entire student body, but the first period computer science class may not be representative of the entire student body.

REF: 062427aai NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

663 ANS:

$$\frac{p(x)}{x-1} = x^2 + 7 + \frac{5}{x-1}$$

$$p(x) = x^3 - x^2 + 7x - 7 + 5$$

$$p(x) = x^3 - x^2 + 7x - 2$$

REF: 061930aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

664 ANS:  
Translation 3 units right and 4 units up

REF: 012027aai NAT: F.IF.C.7 TOP: Graphing Exponential Functions

665 ANS:

$a_1 = 3$   $a_2 = 7$   $a_3 = 15$   $a_4 = 31$ ; No, because there is no common ratio:  $\frac{7}{3} \neq \frac{15}{7}$

REF: 061830aai NAT: F.IF.A.3 TOP: Sequences KEY: recursive

666 ANS:

$$S_5 = \frac{6 - 6(.8)^5}{1 - .8} \approx 20.17$$

REF: 062226aai NAT: F.BF.B.7 TOP: Series KEY: geometric

667 ANS:

About 38%  $\left( \frac{475}{1250} \right)$  of high school juniors in the population will choose a four-year college.

REF: 012432aai NAT: S.IC.B.6 TOP: Analysis of Data

KEY: draw conclusions

668 ANS:



43

REF: 012328aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: percent

669 ANS:

$$P(S \cap M) = P(S) + P(M) - P(S \cup M) = \frac{649}{1376} + \frac{433}{1376} - \frac{974}{1376} = \frac{108}{1376}$$

REF: 061629aai NAT: S.CP.B.7 TOP: Addition Rule

670 ANS:

$$2x^4 - 10x^3 + 3x^2 - 15x = x(2x^3 - 10x^2 + 3x - 15) = x(2x^2(x - 5) + 3(x - 5)) = x(2x^2 + 3)(x - 5)$$

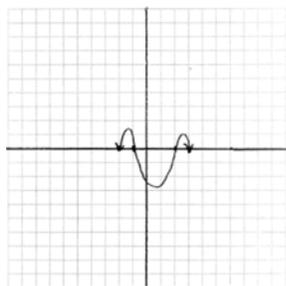
REF: 082427aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

671 ANS:

$$\frac{2x^{\frac{3}{2}}}{2x^{\frac{1}{2}}} = x^{\frac{1}{2}} = \sqrt{x}$$

REF: 081826aii    NAT: N.RN.A.2    TOP: Radicals and Rational Exponents  
KEY: variables

672 ANS:



REF: 011831aii    NAT: F.IF.C.7    TOP: Graphing Polynomial Functions

673 ANS:

$\csc \theta = \frac{1}{\sin \theta}$ , and  $\sin \theta$  on a unit circle represents the  $y$  value of a point on the unit circle. Since  $y = \sin \theta$ ,  
 $\csc \theta = \frac{1}{y}$ .

REF: 011727aii    NAT: F.TF.A.2    TOP: Reciprocal Trigonometric Relationships

674 ANS:

$e^{0.0532} > 1$ , so  $P(t)$  is increasing.

REF: 062327aii    NAT: F.IF.C.7    TOP: Graphing Exponential Functions

675 ANS:

$m(3) = 3^3 - 3^2 - 5(3) - 3 = 27 - 9 - 15 - 3 = 0$  Since  $m(3) = 0$ , there is no remainder when  $m(x)$  is divided by  $x - 3$ , and so  $x - 3$  is a factor.

REF: 012026aii    NAT: A.APR.B.2    TOP: Remainder and Factor Theorems

676 ANS:

$$A = Pe^{rt}$$

$$135000 = 100000e^{5r}$$

$$1.35 = e^{5r}$$

$$\ln 1.35 = \ln e^{5r}$$

$$\ln 1.35 = 5r$$

$$.06 \approx r \text{ or } 6\%$$

REF: 061632aii    NAT: F.LE.A.4    TOP: Exponential Growth

677 ANS:

$$\frac{1}{8} + \frac{1}{6} = \frac{1}{t_b}; \quad \frac{24t_b}{8} + \frac{24t_b}{6} = \frac{24t_b}{t_b}$$

$$3t_b + 4t_b = 24$$

$$t_b = \frac{24}{7} \approx 3.4$$

REF: 011827aii NAT: A.REI.A.2 TOP: Solving Rationals

678 ANS:

$$\frac{9}{6} = 1.5 \quad a_1 = 6$$

$$a_n = 1.5 \cdot a_{n-1}$$

REF: 061931aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive

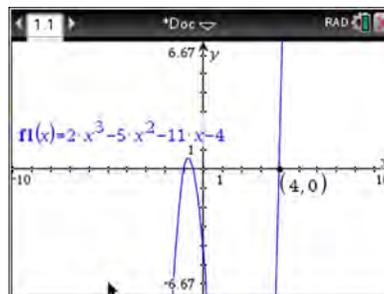
679 ANS:

$\frac{B(11) - B(8)}{11 - 8} \approx -10.1$  The average monthly high temperature decreases  $10.1^\circ$  each month from August to November.

REF: 011930aii NAT: F.IF.B.6 TOP: Rate of Change  
KEY: trigonometric

680 ANS:

$f(4) = 2(4)^3 - 5(4)^2 - 11(4) - 4 = 128 - 80 - 44 - 4 = 0$  Any method that demonstrates 4 is a zero of  $f(x)$  confirms



that  $x - 4$  is a factor, as suggested by the Remainder Theorem.

REF: spr1507aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

681 ANS:

$q$  has the smaller minimum value for the domain  $[-2, 2]$ .  $h$ 's minimum is  $-1(2(-1) + 1)$  and  $q$ 's minimum is  $-8$ .

REF: 011830aii NAT: F.IF.C.9 TOP: Comparing Functions

682 ANS:

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = \frac{a^{\frac{10}{5}}}{a^{\frac{3}{2}}} = \frac{a^{\frac{20}{10}}}{a^{\frac{15}{10}}} = a^{\frac{5}{10}} \quad x = \frac{1}{2}$$

REF: 012528aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

683 ANS:

$$b^2 - 4ac = (-4)^2 - 4(1)(13) = 16 - 52 = -36 \text{ imaginary}$$

REF: 062225aai NAT: A.REI.B.4 TOP: Using the Discriminant

KEY: determine nature of roots

684 ANS:

$$(2xi^3 - 3y)^2 = 4x^2i^6 - 12xyi^3 + 9y^2 = -4x^2 + 12xyi + 9y^2$$

REF: 012431aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

685 ANS:

250(1) + 2450 = 2700 The maximum lung capacity of a person is 2700 mL.

REF: 081928aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

686 ANS:

$$P(W/D) = \frac{P(W \cap D)}{P(D)} = \frac{.4}{.5} = .8$$

REF: 081726aai NAT: S.CP.A.3 TOP: Conditional Probability

687 ANS:

$$\ln e^{1.5t} = \ln \frac{16}{3.8}$$

$$1.5t = \ln \frac{16}{3.8}$$

$$t = \frac{\ln \frac{16}{3.8}}{1.5} \approx .96$$

REF: 062426aai NAT: F.LE.A.4 TOP: Exponential Equations

KEY: without common base

688 ANS:

$$\left( \frac{\frac{17}{8}}{\frac{10}{8}} \right)^{-4} = y^n \quad n = -\frac{7}{2}$$

$$\left( \frac{7}{8} \right)^{-4} = y^n$$

$$y^{-\frac{7}{2}} = y^n$$

REF: 082228aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

689 ANS:

$$\frac{60-20}{4-2} = \frac{40}{2} = 20$$

REF: 082225aia NAT: F.IF.B.6 TOP: Rate of Change

KEY: graph

690 ANS:

Pick random names from a list of all students and ask each one his method.

REF: 062325aia NAT: S.IC.B.6 TOP: Analysis of Data

KEY: bias

691 ANS:

$$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(8)}}{2(3)} = -\frac{5}{6} \pm \frac{i\sqrt{71}}{6}$$

REF: 082327aia NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

692 ANS:

$$6x \left( \frac{1}{2x} - \frac{5}{6} = \frac{3}{x} \right)$$

$$3 - 5x = 18$$

$$-15 = 5x$$

$$-3 = x$$

REF: 012526aia NAT: A.REI.A.2 TOP: Solving Rationals

## Algebra II 4 Point Regents Exam Questions Answer Section

693 ANS:

$.651 \pm 2 \cdot .034 = .58 - .72$ . No, since .61 (122/200) falls within the 95% interval.

REF: 062235aai NAT: S.IC.A.2 TOP: Analysis of Data

694 ANS:

$$\text{normcdf}(510, 540, 480, 24) = 0.0994 \quad z = \frac{510 - 480}{24} = 1.25 \quad 1.25 = \frac{x - 510}{20} \quad 2.5 = \frac{x - 510}{20} \quad 535 - 560$$

$$z = \frac{540 - 480}{24} = 2.5 \quad x = 535 \quad x = 560$$

REF: fall1516aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: probability

695 ANS:

$$\begin{array}{r} 6x - 3y + 2z = -10 \quad x + 3y + 5z = 45 \quad 4x + 10z = 62 \quad 4x + 4(7) = 20 \quad 6(-2) - 3y + 2(7) = -10 \\ -2x + 3y + 8z = 72 \quad 6x - 3y + 2z = -10 \quad 4x + 4z = 20 \quad 4x = -8 \quad -3y = -12 \\ 4x + 10z = 62 \quad 7x + 7z = 35 \quad 6z = 42 \quad x = -2 \quad y = 4 \\ 4x + 4z = 20 \quad z = 7 \end{array}$$

REF: spr1510aai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

696 ANS:

$$20000 = PMT \left( \frac{1 - (1 + .00625)^{-60}}{0.00625} \right) \quad 21000 - x = 300 \left( \frac{1 - (1 + .00625)^{-60}}{0.00625} \right)$$

$$PMT \approx 400.76$$

$$x \approx 6028$$

REF: 011736aai NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

697 ANS:

$$\begin{array}{r} 4x + 6y - 8z = -2 \quad 4x + 6y - 8z = -2 \quad 4x - 8y + 20z = 12 \quad z + 2 = 3z - 4 \quad y = 3 + 2 \quad -4x + 5 + 3 = 16 \\ 4x - 8y + 20z = 12 \quad \underline{-4x + y + z = 16} \quad \underline{-4x + y + z = 16} \quad 6 = 2z \quad = 5 \quad -4x = 8 \\ -4x + y + z = 16 \quad 7y - 7z = 14 \quad -7y + 21z = 28 \quad z = 3 \quad x = -2 \\ y - z = 2 \quad y - 3z = -4 \\ y = z + 2 \quad y = 3z - 4 \end{array}$$

REF: 081833aai NAT: A.REI.C.6 TOP: Solving Linear Systems

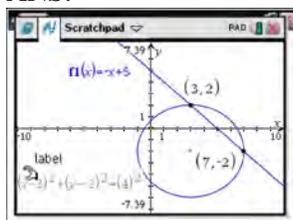
KEY: three variables

698 ANS:

$.795 \pm 2 \cdot .085 = .625 - .965$ . Yes, as it is plausible at least .625 of the customers will purchase both.

REF: 062435aai NAT: S.IC.A.2 TOP: Analysis of Data

699 ANS:



$$y = -x + 5 \quad y = -7 + 5 = -2$$

$$(x - 3)^2 + (-x + 5 + 2)^2 = 16 \quad y = -3 + 5 = 2$$

$$x^2 - 6x + 9 + x^2 - 14x + 49 = 16$$

$$2x^2 - 20x + 42 = 0$$

$$x^2 - 10x + 21 = 0$$

$$(x - 7)(x - 3) = 0$$

$$x = 7, 3$$

REF: 061633aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

700 ANS:

$$j(-1) = 2(-1)^4 - (-1)^3 - 35(-1)^2 + 16(-1) + 48 = 2 + 1 - 35 - 16 + 48 = 0; \quad x + 1 \text{ is a factor of } j(x);$$

$$2x^3 - 3x^2 - 32x + 48 = 0$$

$$x^2(2x - 3) - 16(2x - 3) = 0$$

$$(x^2 - 16)(2x - 3) = 0$$

$$x = \pm 4, \frac{3}{2}$$

REF: 081834aai NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

701 ANS:

$$\begin{array}{r}
 \phantom{x-4)} \phantom{3x^3} + 8x + 34 \\
 \underline{3x^3 - 4x^2 + 2x - 1} \phantom{+ \frac{135}{x-4}} \\
 \phantom{3x^3} - 12x^2 \phantom{+ 8x + 34} \\
 \phantom{3x^3} \phantom{- 12x^2} + 8x^2 + 2x \phantom{+ 34} \\
 \phantom{3x^3} \phantom{- 12x^2} \phantom{+ 8x^2} - 32x \phantom{+ 34} \\
 \phantom{3x^3} \phantom{- 12x^2} \phantom{+ 8x^2} \phantom{- 32x} + 34x - 1 \\
 \phantom{3x^3} \phantom{- 12x^2} \phantom{+ 8x^2} \phantom{- 32x} \phantom{+ 34x} - 136 \\
 \phantom{3x^3} \phantom{- 12x^2} \phantom{+ 8x^2} \phantom{- 32x} \phantom{+ 34x} \phantom{- 136} + 135
 \end{array}$$

$x = 4$  is not a root of  $f(x)$  because  $\frac{f(x)}{g(x)}$  has a remainder.

REF: 082235aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

702 ANS:

$$3\sqrt{x} - 2x = -5 \quad 1 \text{ is extraneous.}$$

$$3\sqrt{x} = 2x - 5$$

$$9x = 4x^2 - 20x + 25$$

$$4x^2 - 29x + 25 = 0$$

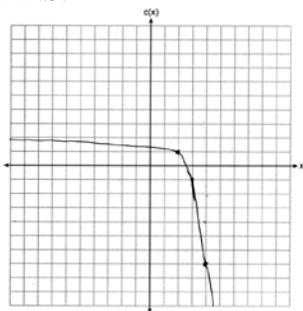
$$(4x - 25)(x - 1) = 0$$

$$x = \frac{25}{4}, 1$$

REF: 011936aia NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

703 ANS:

As  $x \rightarrow \infty, c(x) \rightarrow -\infty$ . As  $x \rightarrow -\infty, c(x) \rightarrow 2$ .

REF: 012335aia NAT: F.IF.C.7 TOP: Graphing Exponential Functions

704 ANS:

$$\begin{array}{l} 2x + 4y - 3z = 12 \quad 2x + 4y - 3z = 12 \quad 8x + z = -6 \quad 32x + 4z = -24 \quad 8(-1) + z = -6 \quad -(-1) + y - 3(2) = 0 \\ 2(3x - 2y + 2z = -9) \quad 6x - 4y + 4z = -18 \quad 2x - 8z = -18 \quad \underline{x - 4z = -9} \quad z = 2 \quad y = 5 \\ 4(-x + y - 3z = 0) \quad -4x + 4y - 12z = 0 \quad 33x = -33 \\ x = -1 \end{array}$$

REF: 082335aia NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

705 ANS:

$$\sqrt{49 - 10x} = 2x - 5 \quad -\frac{3}{2} \text{ is extraneous.}$$

$$49 - 10x = 4x^2 - 20x + 25$$

$$0 = 4x^2 - 10x - 24$$

$$0 = 2x^2 - 5x - 12$$

$$0 = (2x + 3)(x - 4)$$

$$x = -\frac{3}{2}, 4$$

REF: 012333aii NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

706 ANS:

$$\frac{3 + 42}{1500} = 3\% \quad \frac{3}{3 + 12} = 20\% \quad \text{No, because a person is more likely to be allergic milk if he is also allergic to nuts.}$$

REF: 012433aii NAT: S.CP.A.4 TOP: Conditional Probability

707 ANS:

.819  $\pm$  2  $\cdot$  .053 = .713  $-$  .925. Since .70 does not fall within the 95% interval.

REF: 082236aii NAT: S.IC.A.2 TOP: Analysis of Data

708 ANS:

$$a + 4b + 6c = 23 \quad a + 2b + c = 2 \quad 8b + 3c = 16 \quad 2b + 5(4) = 21 \quad a + 4\left(\frac{1}{2}\right) + 6(4) = 23$$

$$\underline{a + 2b + c = 2} \quad \underline{-a + 6b + 2c = 14} \quad \underline{8b + 20c = 84} \quad 2b = 1 \quad a + 2 + 24 = 23$$

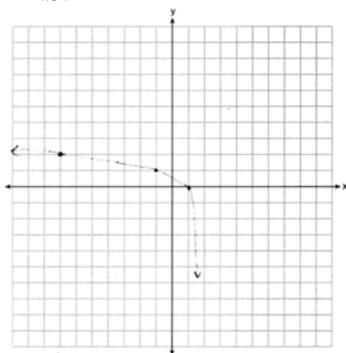
$$2b + 5c = 21 \quad 8b + 3c = 16 \quad 17c = 68 \quad b = \frac{1}{2} \quad a = -3$$

$$c = 4$$

REF: 011933aii NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

709 ANS:

Domain:  $x < 2$ , Asymptote  $x = 2$ 

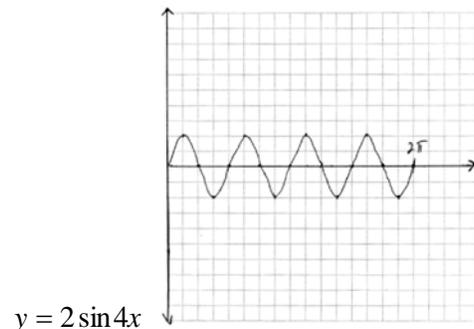
REF: 012034aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

710 ANS:

$0.301 \pm 2(0.058) \rightarrow 0.185 - 0.417 \frac{14}{60} \approx 0.23$ . It is not unusual because 0.23 falls within this interval.

REF: 081935aii NAT: S.IC.B.5 TOP: Analysis of Data

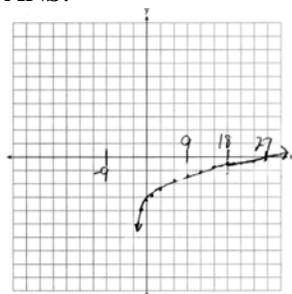
711 ANS:



REF: 081934aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: graph

712 ANS:

As  $x \rightarrow -3, y \rightarrow -\infty$ . As  $x \rightarrow \infty, y \rightarrow \infty$ .

REF: 061735aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

713 ANS:

$23 - 18 = 5$ ,  $\bar{x} \pm 2\sigma = -3.07 - 3.13$ , Yes, a difference of 5 or more occurred three times out of a thousand, which is statistically significant.

REF: 061834aii NAT: S.IC.B.5 TOP: Analysis of Data

714 ANS:

$$\begin{aligned} \left(\sqrt{2x-7}\right)^2 &= (5-x)^2 & \sqrt{2(4)-7}+4=5 & \sqrt{2(8)-7}+8=5 \\ 2x-7 &= 25-10x+x^2 & \sqrt{1} &= 1 & \sqrt{9} &\neq -3 \\ 0 &= x^2-12x+32 \\ 0 &= (x-8)(x-4) \\ x &= 4, 8 \end{aligned}$$

REF: 081635aii NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

715 ANS:

$$\frac{3p}{p-5} = \frac{p+2}{p+3}$$

$$3p^2 + 9p = p^2 - 3p - 10$$

$$2p^2 + 12p + 10 = 0$$

$$p^2 + 6p + 5 = 0$$

$$(p+5)(p+1) = 0$$

$$p = -5, -1$$

REF: 081733aii NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

716 ANS:

$\frac{1}{10}, \frac{1}{5}$ , and no, since 0.10 clearly falls within 95% of 0.20.

REF: 012334aii NAT: S.IC.A.2 TOP: Analysis of Data

717 ANS:

$$\begin{array}{ccccccc} x+y+z=1 & x+y+z=1 & x+y+z=1 & -2z-z=3 & y-(-1)=3 & x+2-1=1 & \\ x+2y+3z=1 & x+2y+3z=1 & -x+3y-5z=11 & -3z=3 & y=2 & x=0 & \\ -x+3y-5z=11 & y+2z=0 & 4y-4z=12 & z=-1 & & & \\ & y=-2z & y-z=3 & & & & \end{array}$$

REF: 061733aii NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

718 ANS:

$$\sqrt{6-2x} + x = 2x + 30 - 9 \quad \sqrt{6-2(-29)} \neq -29 + 21, \text{ so } -29 \text{ is extraneous.}$$

$$\sqrt{6-2x} = x + 21 \quad \sqrt{64} \neq -8$$

$$6 - 2x = x^2 + 42x + 441$$

$$x^2 + 44x + 435 = 0$$

$$(x+29)(x+15) = 0$$

$$x = -29, -15$$

REF: 061833aii NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

719 ANS:

$N(t) = 950e^{0.0475t}$  The base is  $e$  because growth is continuous.  $N\left(\frac{36}{24}\right) \approx 1020$

REF: 081933aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

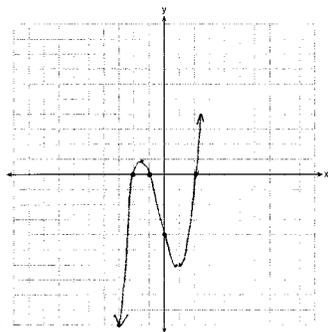
720 ANS:

$\frac{B(10) - B(6)}{10 - 6} \approx -3.88$ . The average monthly high temperature decreases about  $4^\circ$  each month from June and October.

REF: 012336aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: trigonometric

721 ANS:



$$0 = x^2(x + 1) - 4(x + 1)$$

$$0 = (x^2 - 4)(x + 1)$$

$$0 = (x + 2)(x - 2)(x + 1)$$

$$x = -2, -1, 2$$

REF: 081633aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

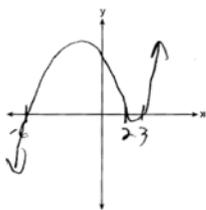
722 ANS:

Jillian's plan, because distance increases by one mile each week.  $a_1 = 10$        $a_n = n + 12$

$$a_n = a_{n-1} + 1$$

REF: 011734aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive

723 ANS:



$$p(x) = (x - 2)(x - 3)(x + 6)$$

REF: 062333aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

724 ANS:

$$M = 172600 \cdot \frac{0.00305(1 + 0.00305)^{12 \cdot 15}}{(1 + 0.00305)^{12 \cdot 15} - 1} \approx 1247 \quad 1100 = (172600 - x) \cdot \frac{0.00305(1 + 0.00305)^{12 \cdot 15}}{(1 + 0.00305)^{12 \cdot 15} - 1}$$

$$1100 \approx (172600 - x) \cdot (0.007228)$$

$$152193 \approx 172600 - x$$

$$20407 \approx x$$

REF: 061734aai NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

725 ANS:

$$\frac{f(4) - f(-2)}{4 - (-2)} = \frac{80 - 1.25}{6} = 13.125 \quad g(x) \text{ has a greater rate of change}$$

$$\frac{g(4) - g(-2)}{4 - (-2)} = \frac{179 - (-49)}{6} = 38$$

REF: 061636aai NAT: F.IF.B.6 TOP: Rate of Change

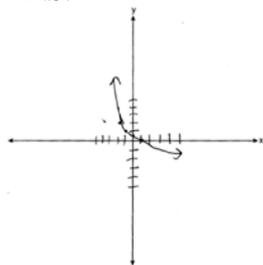
KEY: exponential

726 ANS:

$$P(F|L) = \frac{12}{27} \quad P(F) = \frac{22}{45} \quad \text{Since } P(F|L) \neq P(F), \text{ the events are not independent.}$$

REF: 061936aai NAT: S.CP.A.4 TOP: Conditional Probability

727 ANS:

As  $x \rightarrow -3$ ,  $y \rightarrow \infty$ . As  $x \rightarrow \infty$ ,  $y \rightarrow -\infty$ .

REF: 082333aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

728 ANS:

$$A(t) = 4000 \left( 1 + \frac{2.4\%}{12} \right)^{12t} \quad B(t) = 3500 \left( 1 + \frac{4\%}{4} \right)^{4t} \quad 8.4, \text{ the value of } t \text{ for which } A(t) = B(t)$$

REF: 012435aai NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

729 ANS:

$$16x^4 - 81 = (4x^2 + 9)(4x^2 - 9) = (4x^2 + 9)(2x + 3)(2x - 3). \quad \text{No, because } \pm \frac{3i}{2} \text{ are roots.}$$

REF: 061933aai NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

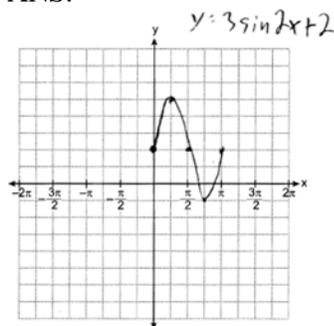
730 ANS:

$$\text{China: } \frac{P(120) - P(50)}{120 - 50} \approx 13.5 \quad \text{India: } \frac{1380 - 376.3}{120 - 50} \approx 14.3 \quad \text{India}$$

REF: 082433aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: exponential

731 ANS:



$$0 < x < \frac{\pi}{4}$$

REF: 012436aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: graph

732 ANS:

$$x+2 \overline{) \begin{array}{r} x^3 \phantom{+ 4} \\ x^4 + 2x^3 + 4x - 10 \end{array}} \quad x^3 + 4 - \frac{18}{x+2}. \text{ No, because there is a remainder.}$$

$$\underline{x^4 + 2x^3}$$

$$4x - 10$$

$$\underline{4x + 8}$$

$$-18$$

REF: 011934aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

733 ANS:

$$\frac{x-2}{(x-6)(x-2)} + \frac{x(x-6)}{(x-6)(x-2)} = \frac{4}{(x-6)(x-2)}. \text{ 6 is extraneous.}$$

$$x - 2 + x^2 - 6x = 4$$

$$x^2 - 5x - 6 = 0$$

$$(x-6)(x+1) = 0$$

$$x = 6, -1$$

REF: 082334aii NAT: A.REI.A.2 TOP: Solving Rationals

734 ANS:

$$7 = 20(0.5)^{\frac{t}{8.02}}$$

$$\log 0.35 = \log 0.5^{\frac{t}{8.02}}$$

$$\log 0.35 = \frac{t \log 0.5}{8.02}$$

$$\frac{8.02 \log 0.35}{\log 0.5} = t$$

$$t \approx 12$$

REF: 081634aai NAT: F.LE.A.4 TOP: Exponential Decay

735 ANS:

$$\text{No, because } f(-x) = 2^{-x} \quad g(x) = f(x) + 5 \quad y = 2^x + 5$$

$$2^{-x} \neq 2^x \quad x = 2^y + 5$$

$$\log(x - 5) = \log 2^y$$

$$\frac{\log(x - 5)}{\log 2} = \frac{y \log 2}{\log 2}$$

$$\frac{\log(x - 5)}{\log 2} = h(x)$$

REF: 082435aai NAT: F.BF.B.5 TOP: Inverse of Functions

KEY: exponential

736 ANS:

$$\frac{1200}{1200 + 2016} \approx .373. \text{ Yes, because } \frac{1600}{4288} \approx .373 \text{ also.}$$

REF: 062334aai NAT: S.CP.A.4 TOP: Conditional Probability

737 ANS:

$$s(t) = 200(0.5)^{\frac{t}{15}} \quad \frac{1}{10} = (0.5)^{\frac{t}{15}}$$

$$\log \frac{1}{10} = \log(0.5)^{\frac{t}{15}}$$

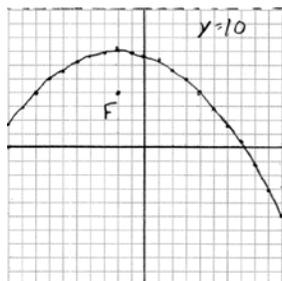
$$-1 = \frac{t \cdot \log(0.5)}{15}$$

$$t = \frac{-15}{\log(0.5)} \approx 50$$

REF: 061934aai NAT: F.LE.A.4 TOP: Exponential Decay

738 ANS:

$$\frac{10-4}{2} = 7, \text{ so the vertex is } (-2, 7) \text{ and } p = 3. \quad y = -\frac{1}{4(3)}(x+2)^2 + 7 = y = -\frac{1}{12}(x+2)^2 + 7$$



REF: 012535aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

739 ANS:

$$\frac{47}{108} = \frac{1}{4} + \frac{116}{459} - P(M \text{ and } J); \text{ No, because } \frac{31}{459} \neq \frac{1}{4} \cdot \frac{116}{459}$$

$$P(M \text{ and } J) = \frac{31}{459}$$

REF: 011834aai NAT: S.CP.B.7 TOP: Addition Rule

740 ANS:

$$\frac{6.25 - 2.25}{21 - 5} = \frac{4}{16} = \$0.25 \text{ fine per day. } 2.25 - 5(.25) = \$1 \text{ replacement fee. } a_n = 1.25 + (n-1)(.25). \quad a_{60} = \$16$$

REF: 081734aai NAT: F.BF.A.2 TOP: Sequences KEY: explicit

741 ANS:

$$\begin{array}{rclclcl} 6x - 16y + 4z = -120 & 6x - 21y - 15z = -93 & 6x - 16y + 4z = -120 & 6 + z = 3 & -6x + 2(6) - 4(-3) = 36 & \\ 6x - 21y - 15z = -93 & \underline{-6x + 2y - 4z = 36} & \underline{-6x + 2y - 4z = 36} & z = -3 & -6x + 24 = 36 & \\ -6x + 2y - 4z = 36 & -19y - 19z = -57 & -14y = -84 & & -6x = 12 & \\ & y + z = 3 & y = 6 & & x = -2 & \end{array}$$

REF: 062433aai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

742 ANS:

$$2 = e^{0.0375t}$$

$$t \approx 18.5$$

REF: 081835aai NAT: F.LE.A.4 TOP: Exponential Growth

743 ANS:

$$(x-2)^2 + (-2x+7-3)^2 = 20 \quad y = -2(0)+7 = 7 \quad (0,7), (4,-1)$$

$$(x-2)^2 + (-2x+4)^2 = 20 \quad y = -2(4)+7 = -1$$

$$x^2 - 4x + 4 + 4x^2 - 16x + 16 = 20$$

$$5x^2 - 20x = 0$$

$$5x(x-4) = 0$$

$$x = 0, 4$$

REF: 062335aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

744 ANS:



REF: 082234aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

745 ANS:

$$\frac{H(10) - H(2)}{10 - 2} \approx 11524 \quad \text{From 2014-2018, the median house price increased } \$11524 \text{ per year on average.}$$

REF: 062434aii NAT: F.IF.B.6 TOP: Rate of Change

KEY: exponential

746 ANS:

$$S_n = \frac{33000 - 33000(1.04)^n}{1 - 1.04} \quad S_{15} = \frac{33000 - 33000(1.04)^{15}}{1 - 1.04} \approx 660778.39$$

REF: 061634aii NAT: F.BF.B.7 TOP: Series KEY: geometric

747 ANS:

$$.74 \cdot .24 = .1776 \quad .74 + .24 - .1776 = .8024$$

REF: 012533aii NAT: S.CP.B.7 TOP: Addition Rule

748 ANS:

$$2x - 6 = 2\sqrt{x - 1} \quad 2 \text{ is extraneous.}$$

$$4x^2 - 24x + 36 = 4(x - 1)$$

$$x^2 - 6x + 9 = x - 1$$

$$x^2 - 7x + 10 = 0$$

$$(x - 5)(x - 2) = 0$$

$$x = 2, 5$$

REF: 012434aii NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

749 ANS:

$$x^2 - 6x = -17 \quad \text{The solution is imaginary because the parabola and line do not intersect.}$$

$$x^2 - 6x + 9 = -17 + 9$$

$$(x - 3)^2 = -8$$

$$x - 3 = \pm 2i\sqrt{2}$$

$$x = 3 \pm 2i\sqrt{2}$$

REF: 081936aii NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | completing the square

750 ANS:

$$f(x) = x^2(x + 4)(x - 3); \quad g(x) = (x + 2)^2(x + 6)(x - 1)$$

REF: 011836aii NAT: F.BF.B.3 TOP: Transformations with Functions

751 ANS:

$0.506 \pm 2 \cdot 0.078 = 0.35 - 0.66$ . The 32.5% value falls below the 95% confidence level.

REF: 061736aii NAT: S.IC.B.5 TOP: Analysis of Data

752 ANS:

$$\text{a) } p(t) = 11000(2)^{\frac{t}{20}}; \text{ b) } \frac{1000000}{11000} = \frac{11000(2)^{\frac{t}{20}}}{11000}$$

$$\log \frac{1000}{11} = \log 2^{\frac{t}{20}}$$

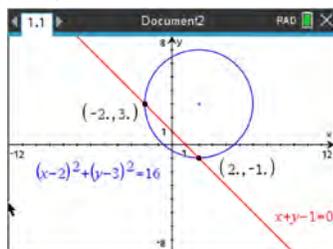
$$\log \frac{1000}{11} = \frac{t \cdot \log 2}{20}$$

$$\frac{20 \log \frac{1000}{11}}{\log 2} = t$$

$$t \approx 130.13$$

REF: 082233aai NAT: F.LE.A.4 TOP: Exponential Growth

753 ANS:



$$y = -x + 1 \quad y = -2 + 1 = -1 \quad (2, -1)$$

$$(x-2)^2 + (-x+1-3)^2 = 16 \quad y = 2+1 = 3 \quad (-2, 3)$$

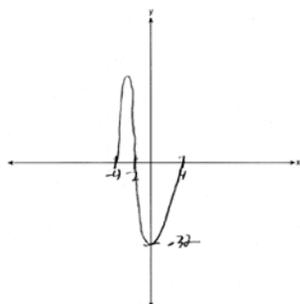
$$x^2 - 4x + 4 + x^2 + 4x + 4 = 16$$

$$2x^2 = 8$$

$$x = -2, 2$$

REF: 012035aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

754 ANS:



$$x^3 + 2x^2 - 16x - 32 = 0$$

$$x^2(x+2) - 16(x+2) = 0$$

$$(x^2 - 16)(x+2) = 0$$

$$(x+4)(x-4)(x+2) = 0$$

$$x = -4, 4, -2$$

REF: 012536aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

755 ANS:

$$x^2 + (2x - 5)^2 = 25 \quad y + 5 = 2(0) \quad y + 5 = 2(4) \quad (0, -5), (4, 3)$$

$$x^2 + 4x^2 - 20x + 25 = 25 \quad y = -5 \quad y = 3$$

$$5x^2 - 20x = 0$$

$$5x(x - 4) = 0$$

$$x = 0, 4$$

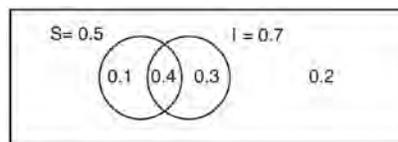
REF: 062236aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

756 ANS:

$42.029 \pm 2 \cdot 3.105 \approx 35.82 - 48.24$ . Yes, since 49.8 falls outside the 95% interval.

REF: 082434aii NAT: S.IC.A.2 TOP: Analysis of Data

757 ANS:



This scenario can be modeled with a Venn Diagram:

Since  $P(S \cup I) = 0.2$ ,  $P(S \cup I) = 0.8$ . Then,  $P(S \cap I) = P(S) + P(I) - P(S \cup I)$  If  $S$  and  $I$  are independent, then the

$$= 0.5 + 0.7 - 0.8$$

$$= 0.4$$

Product Rule must be satisfied. However,  $(0.5)(0.7) \neq 0.4$ . Therefore, salary and insurance have not been treated independently.

REF: spr1513aii NAT: S.CP.B.7 TOP: Addition Rule

758 ANS:

$$a_n = x^{n-1}(x+1) \quad x^{n-1} = 0 \quad x+1 = 0$$

$$x = 0 \quad x = -1$$

REF: spr1511aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive

759 ANS:

$$2x^3 - 10x^2 + 11x - 7 = 2x^3 + hx^2 + 3x - 8x^2 - 4hx - 12 + k \quad h = -2$$

$$-2x^2 + 8x + 5 = hx^2 - 4hx + k \quad k = 5$$

REF: 011733aii NAT: A.APR.C.4 TOP: Polynomial Identities

760 ANS:

$$t = 2\pi\sqrt{\frac{67}{9.81}} \approx 16.4 \quad 9.6 = 2\pi\sqrt{\frac{L}{9.81}}$$

$$L \approx 22.9$$

REF: 062234aii NAT: A.REI.A.2 TOP: Solving Radicals  
KEY: context

761 ANS:

$$\left(2x^2 + x - 3\right) \cdot (x - 1) - \left[\left(2x^2 + x - 3\right) + (x - 1)\right]$$

$$\left(2x^3 - 2x^2 + x^2 - x - 3x + 3\right) - \left(2x^2 + 2x - 4\right)$$

$$2x^3 - 3x^2 - 6x + 7$$

REF: 011833aii NAT: F.BF.A.1 TOP: Operations with Functions

762 ANS:

Yes. The margin of error from this simulation indicates that 95% of the observations fall within  $\pm 0.12$  of the simulated proportion, 0.25. The margin of error can be estimated by multiplying the standard deviation, shown to be 0.06 in the dotplot, by 2, or applying the estimated standard error formula,  $\left(\sqrt{\frac{p(1-p)}{n}}\right)$  or  $\left(\sqrt{\frac{(0.25)(0.75)}{50}}\right)$

and multiplying by 2. The interval  $0.25 \pm 0.12$  includes plausible values for the true proportion of people who prefer Stephen's new product. The company has evidence that the population proportion could be at least 25%. As seen in the dotplot, it can be expected to obtain a sample proportion of 0.18 (9 out of 50) or less several times, even when the population proportion is 0.25, due to sampling variability. Given this information, the results of the survey do not provide enough evidence to suggest that the true proportion is not at least 0.25, so the development of the product should continue at this time.

REF: spr1512aii NAT: S.IC.A.2 TOP: Analysis of Data

763 ANS:

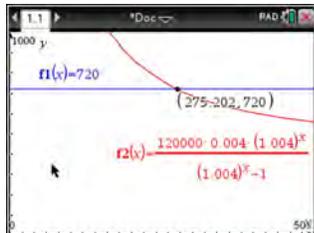
$$a_n = 100(.8)^{n-1} \quad S_{20} = \frac{100 - 100(.8)^{20}}{1 - .8} \approx 494 \quad \text{No, because } 494 > 40 \times 12.$$

REF: 012033aii NAT: F.BF.B.7 TOP: Series KEY: geometric

764 ANS:  
 $138.905 \pm 2 \cdot 7.95 = 123 - 155$ . No, since 125 (50% of 250) falls within the 95% interval.

REF: 011835aai NAT: S.IC.A.2 TOP: Analysis of Data

765 ANS:



$$720 = \frac{120000 \left( \frac{.048}{12} \right) \left( 1 + \frac{.048}{12} \right)^n}{\left( 1 + \frac{.048}{12} \right)^n - 1} \frac{275.2}{12} \approx 23 \text{ years}$$

$$720(1.004)^n - 720 = 480(1.004)^n$$

$$240(1.004)^n = 720$$

$$1.004^n = 3$$

$$n \log 1.004 = \log 3$$

$$n \approx 275.2 \text{ months}$$

REF: spr1509aai NAT: F.LE.A.4 TOP: Exponential Growth

766 ANS:  
 Some of the students who did not drink energy drinks read faster than those who did drink energy drinks.  
 $17.7 - 19.1 = -1.4$  Differences of -1.4 and less occur  $\frac{25}{232}$  or about 10% of the time, so the difference is not unusual.

REF: 081636aai NAT: S.IC.B.5 TOP: Analysis of Data

767 ANS:

$$y = 101.523(.883)^x \quad 29 = 101.523(.883)^x$$

$$\frac{29}{101.523} = (.883)^x$$

$$\log \frac{29}{101.523} = x \log(.883)$$

$$\frac{\log \frac{29}{101.523}}{\log(.883)} = x$$

$$x \approx 10.07$$

REF: 012036aai NAT: S.ID.B.6 TOP: Regression KEY: exponential

768 ANS:  
 $0.01 \pm 2 \cdot 0.38 = -0.75 - 0.77$ . No, since 0.6 falls within the 95% interval.

REF: 082336aai NAT: S.IC.B.5 TOP: Analysis of Data

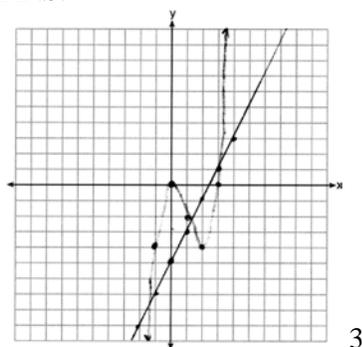
769 ANS:  
 $\frac{h(2) - h(1)}{2 - 1} = -12$ ,  $h(t) = 0$  at  $t \approx 2.2, 3.8$ , using a graphing calculator to find where  $h(t) = 0$ .

REF: 061836aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

770 ANS:  
 $P(P/K) = \frac{P(P \wedge K)}{P(K)} = \frac{1.9}{2.3} \approx 82.6\%$  A key club member has an 82.6% probability of being enrolled in AP Physics.

REF: 011735aai NAT: S.CP.A.3 TOP: Conditional Probability

771 ANS:



REF: 062233aai NAT: A.REI.D.11 TOP: Other Systems  
 KEY: polynomial

772 ANS:  
 $y = 4.168(3.981)^x$ .  $100 = 4.168(3.981)^x$

$$\log \frac{100}{4.168} = \log(3.981)^x$$

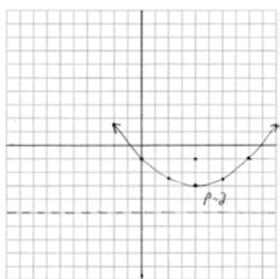
$$\log \frac{100}{4.168} = x \log(3.981)$$

$$\frac{\log \frac{100}{4.168}}{\log(3.981)} = x$$

$$x \approx 2.25$$

REF: 081736aai NAT: S.ID.B.6 TOP: Regression KEY: exponential

773 ANS:



$$y = \frac{1}{4(2)}(x-4)^2 - 3 \quad y = \frac{-1 + -5}{2} = -3. \text{ The vertex is } (4, -3) \text{ and } p = 2.$$

REF: 061935aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

774 ANS:

$$(x-4)^2 + ((x-6)-1)^2 = 9 \quad 7-y = 6 \quad 4-y = 6 \quad (7,1), (4,-2)$$

$$x^2 - 8x + 16 + x^2 - 14x + 49 - 9 = 0 \quad 1 = y \quad -2 = y$$

$$2x^2 - 22x + 56 = 0$$

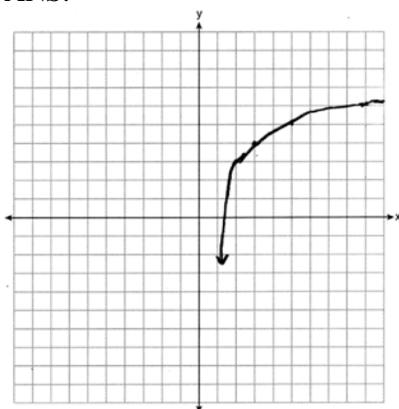
$$x^2 - 11x + 28 = 0$$

$$(x-7)(x-4) = 0$$

$$x = 7, 4$$

REF: 082436aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

775 ANS:



$$x = 1, y = 1$$

REF: 062436aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

776 ANS:

John found the means of the scores of the two rooms and subtracted the means. The mean score for the classical room was 7 higher than the rap room (82-75). Yes, there is less than a 5% chance this difference occurring due to random chance. It is likely the difference was due to the music.

REF: 081836aai NAT: S.IC.B.5 TOP: Analysis of Data

777 ANS:

$$\frac{m(4) - m(-1)}{4 - (-1)} = \frac{81 - 1}{5} = 16 \quad p(x) \text{ has a greater rate of change}$$

$$\frac{p(4) - p(-1)}{4 - (-1)} = 16.1\bar{3}$$

REF: 012534aai NAT: F.IF.B.6 TOP: Rate of Change

KEY: exponential

778 ANS:

$P(x) = 500(0.97)^x$ ; 18; The number of palm trees and flamingos will be equal in 18 years.

$$F(x) = 200e^{0.02x}$$

REF: 062336aai NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

779 ANS:

$0.602 \pm 2 \cdot 0.066 = 0.47 - 0.73$ . Since 0.50 falls within the 95% interval, this supports the concern there may be an even split.

REF: 061635aai NAT: S.IC.B.5 TOP: Analysis of Data

780 ANS:

$$0 = 6(-5)^3 + b(-5)^2 - 52(-5) + 15 \quad z(x) = 6x^3 + 19x^2 - 52x + 15$$

$$0 = -750 + 25b + 260 + 15$$

$$475 = 25b$$

$$19 = b$$

$$\begin{array}{r|rrrr} -5 & 6 & 19 & -52 & 15 \\ & & -30 & 55 & 15 \\ \hline & 6 & -11 & 3 & 0 \end{array}$$

$$6x^2 - 11x + 3 = 0$$

$$(2x - 3)(3x - 1) = 0$$

$$x = \frac{3}{2}, \frac{1}{3}, -5$$

REF: fall1515aai NAT: A.APR.B.3 TOP: Solving Polynomial Equations

781 ANS:

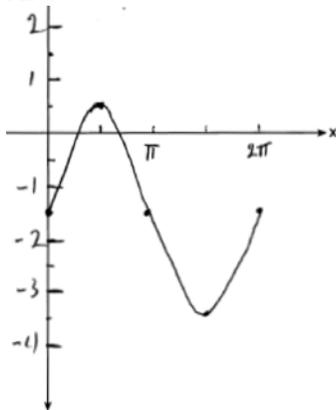
$$C(t) = 63000 \left( 1 + \frac{0.0255}{12} \right)^{12t} = 63000 \left( 1 + \frac{0.0255}{12} \right)^{12t} = 100000$$

$$12t \log(1.002125) = \log \frac{100}{63}$$

$$t \approx 18.14$$

REF: 061835aai NAT: F.LE.A.4 TOP: Exponential Growth

782 ANS:



Part a sketch is shifted  $\frac{\pi}{3}$  units right.

REF: 081735aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

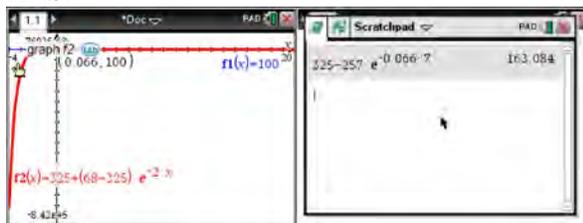
KEY: graph

783 ANS:

$29.101 \pm 2 \cdot 0.934 = 27.23 - 30.97$ . Yes, since 30 falls within the 95% interval.

REF: 011935aii NAT: S.IC.A.2 TOP: Analysis of Data

784 ANS:



$$100 = 325 + (68 - 325)e^{-2k} \quad T = 325 - 257e^{-0.066t}$$

$$-225 = -257e^{-2k} \quad T = 325 - 257e^{-0.066(7)} \approx 163$$

$$k = \frac{\ln\left(\frac{-225}{-257}\right)}{-2}$$

$$k \approx 0.066$$

REF: fall1513aii NAT: F.LE.A.4 TOP: Exponential Growth

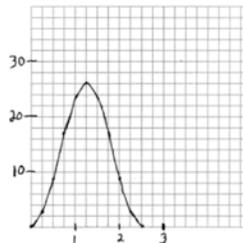
785 ANS:

The mean difference between the students' final grades in group 1 and group 2 is  $-3.64$ . This value indicates that students who met with a tutor had a mean final grade of 3.64 points less than students who used an on-line subscription. One can infer whether this difference is due to the differences in intervention or due to which students were assigned to each group by using a simulation to rerandomize the students' final grades many (500) times. If the observed difference  $-3.64$  is the result of the assignment of students to groups alone, then a difference of  $-3.64$  or less should be observed fairly regularly in the simulation output. However, a difference of  $-3$  or less occurs in only about 2% of the rerandomizations. Therefore, it is quite unlikely that the assignment to groups alone accounts for the difference; rather, it is likely that the difference between the interventions themselves accounts for the difference between the two groups' mean final grades.

REF: fall1514aii NAT: S.IC.B.5 TOP: Analysis of Data

## Algebra II 6 Point Regents Exam Questions Answer Section

1 ANS:



period =  $\frac{2\pi}{0.8\pi} = 2.5$ . The wheel rotates once every 2.5 seconds.  
of  $f(t) = 26$ .

No, because the maximum

REF: 061937aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: graph

2 ANS:

$$A = 5000(1.045)^n \quad 5000\left(1 + \frac{.046}{4}\right)^{4(6)} - 5000(1.045)^6 \approx 6578.87 - 6511.30 \approx 67.57 \quad 10000 = 5000\left(1 + \frac{.046}{4}\right)^{4n}$$

$$B = 5000\left(1 + \frac{.046}{4}\right)^{4n}$$

$$2 = 1.0115^{4n}$$

$$\log 2 = 4n \cdot \log 1.0115$$

$$n = \frac{\log 2}{4 \log 1.0115}$$

$$n \approx 15.2$$

REF: 081637aai NAT: F.LE.A.4 TOP: Exponential Growth

3 ANS:

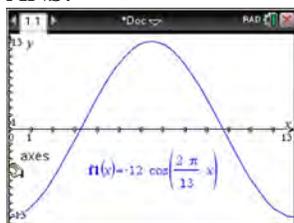
$$112 = 73 + (237 - 73)e^{-1.5k} \quad T(2.5) = 73 + (237 - 73)e^{(-.958)(2.5)} \approx 88 \quad 80 = 73 + (237 - 73)e^{-.958t}$$

$$k \approx .958$$

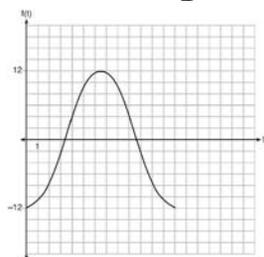
$$t \approx 3.3$$

REF: 062437aai NAT: F.LE.A.4 TOP: Exponential Decay

4 ANS:



The amplitude, 12, can be interpreted from the situation, since the water level has a minimum of  $-12$  and a maximum of  $12$ . The value of  $A$  is  $-12$  since at  $8:30$  it is low tide. The period of the function is 13 hours, and is expressed in the function through the parameter  $B$ . By experimentation with technology or using the relation  $P = \frac{2\pi}{B}$  (where  $P$  is the period), it is determined that  $B = \frac{2\pi}{13}$ .

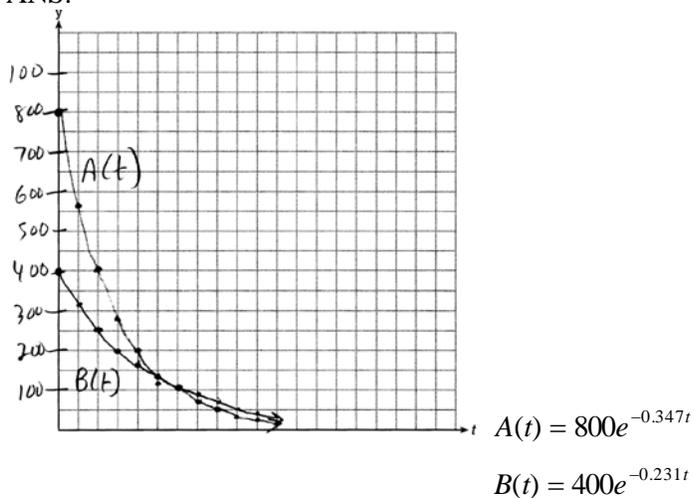


$$f(t) = -12 \cos\left(\frac{2\pi}{13} t\right)$$

In order to answer the question about when to fish, the student must interpret the function and determine which choice,  $7:30$  pm or  $10:30$  pm, is on an increasing interval. Since the function is increasing from  $t = 13$  to  $t = 19.5$  (which corresponds to  $9:30$  pm to  $4:00$  am),  $10:30$  is the appropriate choice.

REF: spr1514aii    NAT: F.IF.C.7    TOP: Graphing Trigonometric Functions  
KEY: graph

5 ANS:



$$800e^{-0.347t} = 400e^{-0.231t} \quad 0.15 = e^{-0.347t}$$

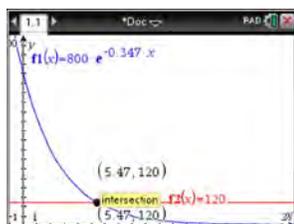
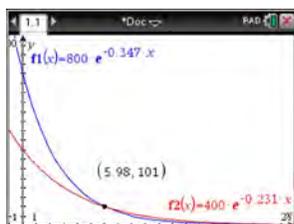
$$\ln 2e^{-0.347t} = \ln e^{-0.231t} \quad \ln 0.15 = \ln e^{-0.347t}$$

$$\ln 2 + \ln e^{-0.347t} = \ln e^{-0.231t} \quad \ln 0.15 = -0.347t \cdot \ln e$$

$$\ln 2 - 0.347t = -0.231t \quad 5.5 \approx t$$

$$\ln 2 = 0.116t$$

$$6 \approx t$$



REF: 061637aia NAT: A.REI.D.11 TOP: Other Systems  
 KEY: exponential

6 ANS:

$$100 = 140 \left( \frac{1}{2} \right)^{\frac{5}{h}} \quad \log \frac{100}{140} = \log \left( \frac{1}{2} \right)^{\frac{5}{h}} \quad 40 = 140 \left( \frac{1}{2} \right)^{\frac{t}{10.3002}}$$

$$\log \frac{5}{7} = \frac{5}{h} \log \frac{1}{2} \quad \log \frac{2}{7} = \log \left( \frac{1}{2} \right)^{\frac{t}{10.3002}}$$

$$h = \frac{5 \log \frac{1}{2}}{\log \frac{5}{7}} \approx 10.3002 \quad \log \frac{2}{7} = \frac{t \log \left( \frac{1}{2} \right)}{10.3002}$$

$$t = \frac{10.3002 \log \frac{2}{7}}{\log \frac{1}{2}} \approx 18.6$$

REF: 061737aii NAT: F.LE.A.4 TOP: Exponential Decay

7 ANS:

$$\text{antibiotic } n(0) = \frac{0+1}{0+5} + \frac{18}{0^2+8(0)+15} = \frac{3}{15} + \frac{18}{15} = \frac{21}{15} \quad \frac{t+1}{t+5} + \frac{18}{t^2+8t+15} = \frac{9}{t+3}$$

$$a(0) = \frac{9}{0+3} = 3 \quad \frac{(t+1)(t+3)}{(t+5)(t+3)} + \frac{18}{(t+3)(t+5)} = \frac{9(t+5)}{(t+3)(t+5)}$$

$$t^2 + 4t + 3 + 18 = 9t + 45$$

$$t^2 - 5t - 24 = 0$$

$$(t-8)(t+3) = 0$$

$$t = 8$$

REF: 012037aii NAT: A.REI.D.11 TOP: Other Systems

KEY: rational

8 ANS:

$$A(t) = 8000 \left( 1 + \frac{.042}{4} \right)^{4t} \quad A(18) = 16970.900 \quad 24000 = 8000e^{.039t}$$

$$B(t) = 8000e^{.039t} \quad B(18) = \underline{16142.274} \quad \ln 3 = \ln e^{.039t}$$

$$828.63 \quad \ln 3 = .039t$$

$$t \approx 28.2$$

REF: 082337aii NAT: F.LE.A.4 TOP: Exponential Growth

9 ANS:

$$1.5\%; P(t) = 92.2(1.015)^t; \quad \frac{300}{92.2} = (1.015)^t$$

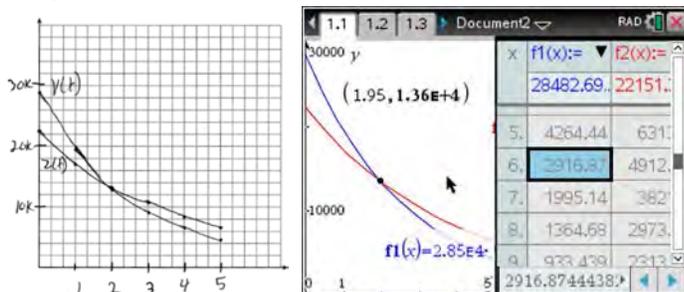
$$\log \frac{300}{92.2} = t \log(1.015)$$

$$\frac{\log \frac{300}{92.2}}{\log(1.015)} = t$$

$$t \approx 79$$

REF: 062237aia NAT: F.BF.A.2 TOP: Sequences KEY: recursive

10 ANS:



At 1.95 years, the value of the car equals the loan

balance. Zach can cancel the policy after 6 years.

REF: 081737aia NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

11 ANS:

$$0 = \sqrt{t} - 2t + 6 \quad 2\left(\frac{9}{4}\right) - 6 < 0, \text{ so } \frac{9}{4} \text{ is extraneous.}$$

$$2t - 6 = \sqrt{t}$$

$$4t^2 - 24t + 36 = t$$

$$4t^2 - 25t + 36 = 0$$

$$(4t - 9)(t - 4) = 0$$

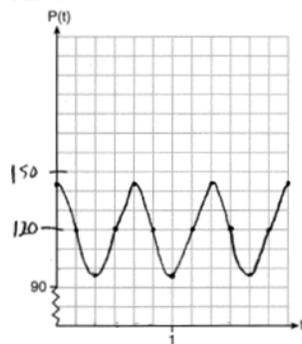
$$t = \frac{9}{4}, 4$$

$$(\sqrt{1} - 2(1) + 6) - (\sqrt{3} - 2(3) + 6) = 5 - \sqrt{3} \approx 3.268 \quad 327 \text{ mph}$$

REF: 011737aia NAT: A.REI.A.2 TOP: Solving Radicals

KEY: context

12 ANS:

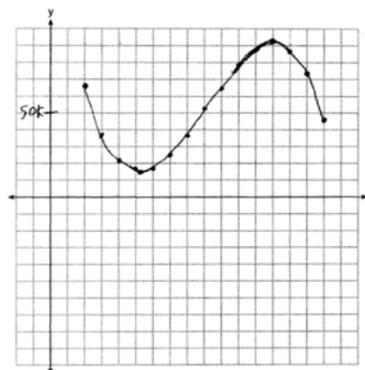


The period of  $P$  is  $\frac{2}{3}$ , which means the patient's blood pressure reaches a high every  $\frac{2}{3}$  second and a low every  $\frac{2}{3}$  second. The patient's blood pressure is high because 144 over 96 is greater than 120 over 80.

REF: 011837aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: graph

13 ANS:



$$P(x) = R(x) - C(x) = -330x^3 + 9000x^2 - 67000x + 167000$$

Least profitable at year 5 because there is a minimum in  $P(x)$ . Most profitable at year 13 because there is a maximum in  $P(x)$ .

REF: 081837aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

14 ANS:

$A(t) = 100(0.5)^{\frac{t}{63}}$ , where  $t$  is time in years, and  $A(t)$  is the amount of titanium-44 left after  $t$  years.

$$\frac{A(10) - A(0)}{10 - 0} = \frac{89.58132 - 100}{10} = -1.041868$$

The estimated mass at  $t = 40$  is  $100 - 40(-1.041868) \approx 58.3$ . The

actual mass is  $A(40) = 100(0.5)^{\frac{40}{63}} \approx 64.3976$ . The estimated mass is less than the actual mass.

REF: fall1517aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

15 ANS:

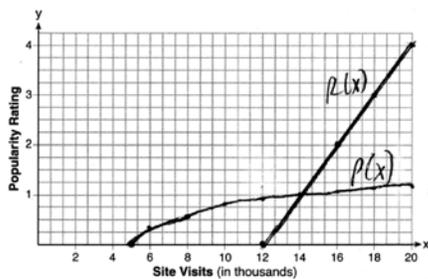
$$T = (400 - 75)e^{-0.0735t} + 75, \quad 325e^{-0.0735(5)} + 75 \approx 300, \quad 270 = (450 - 75)e^{-8r} + 75, \quad 325e^{-0.0735t} + 75 = 375e^{-0.0817t} + 75$$

$$r \approx 0.0817 \qquad t \approx 17$$

REF: 012337aii NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

16 ANS:

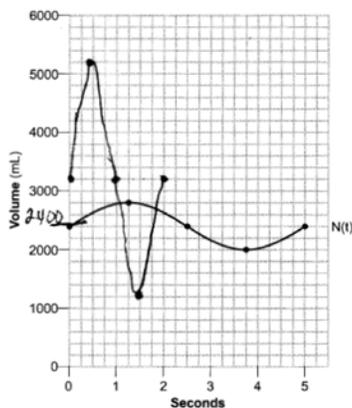


$P(16) = \log(16 - 4) \approx 1.1$ , 14000

REF: 061837aii NAT: A.REI.D.11 TOP: Other Systems

KEY: logarithmic

17 ANS:

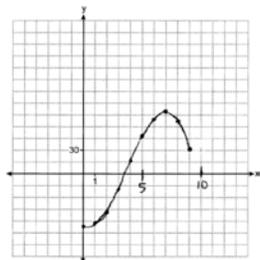


$N(t) = 400 \sin\left(\frac{2\pi}{5} t\right) + 2400$ . 4 times.

REF: 062337aii NAT: A.REI.D.11 TOP: Other Systems

KEY: trigonometric

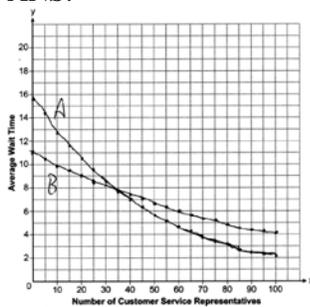
18 ANS:



(7,78) If 7000 sweatshirts are sold, the profit is \$78,000. 3,549, because that is when  $p(x)$  is first greater than 0.

REF: 012437aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

19 ANS:

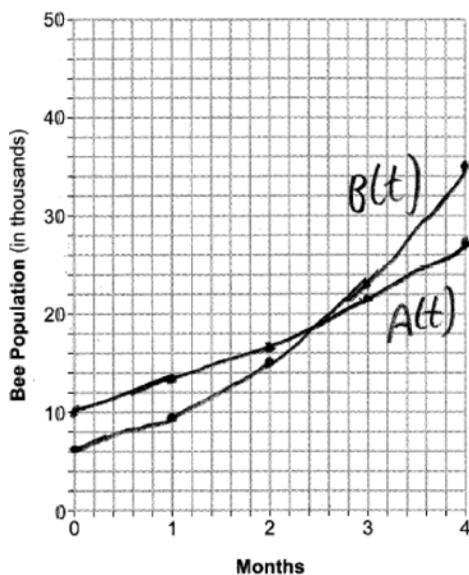


35;  $B(100) - A(100) \approx 2$ , which represents the difference of the average wait time when there are 100 CSRs between the plans.

REF: 082237aii NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

20 ANS:



$$A(t) = 10000e^{0.25t}$$

$$B(t) = 6000e^{0.45t}$$

2.6 months for same.  $30000 = 10000e^{0.25t}$

$$\ln 3 = \ln e^{0.25t}$$

$$\ln 3 = 0.25t \ln e$$

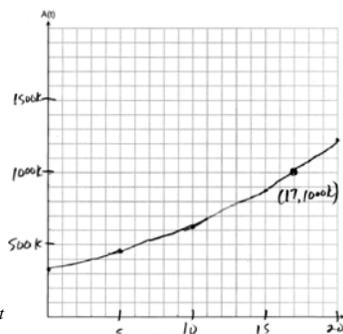
$$\frac{\ln 3}{0.25} = t$$

$$4.4 \approx t$$

REF: 012537aii NAT: A.REI.D.11 TOP: Other Systems

KEY: exponential

21 ANS:



$$A(t) = 318000(1.07)^t$$

$$318000(1.07)^t = 1000000$$

The graph of  $A(t)$  nearly intersects

$$1.07^t = \frac{1000}{318}$$

$$t \log 1.07 = \log \frac{1000}{318}$$

$$t = \frac{\log \frac{1000}{318}}{\log 1.07}$$

$$t \approx 17$$

the point (17, 1000000).

REF: 011937aia NAT: F.LE.A.4 TOP: Exponential Growth

22 ANS:

$$B = 1.69\sqrt{30+4.45} - 3.49 \approx 6, \text{ which is a steady breeze.}$$

$$15 = 1.69\sqrt{s+4.45} - 3.49$$

$$18.49 = 1.69\sqrt{s+4.45}$$

$$\frac{18.49}{1.69} = \sqrt{s+4.45}$$

$$\left(\frac{18.49}{1.69}\right)^2 = s+4.45$$

$$s = \left(\frac{18.49}{1.69}\right)^2 - 4.45$$

$$s \approx 115$$

$$9.5 = 1.69\sqrt{s+4.45} - 3.49$$

$$10.49 = 1.69\sqrt{s+4.45} - 3.49 \quad 55-64$$

$$12.99 = 1.69\sqrt{s+4.45}$$

$$13.98 = 1.69\sqrt{s+4.45}$$

$$\frac{12.99}{1.69} = \sqrt{s+4.45}$$

$$\frac{13.98}{1.69} = \sqrt{s+4.45}$$

$$\left(\frac{12.99}{1.69}\right)^2 = s+4.45$$

$$\left(\frac{13.98}{1.69}\right)^2 = s+4.45$$

$$s = \left(\frac{12.99}{1.69}\right)^2 - 4.45$$

$$s = \left(\frac{13.98}{1.69}\right)^2 - 4.45$$

$$s \approx 55$$

$$s \approx 64$$

REF: 081937aII NAT: A.REI.A.2 TOP: Solving Radicals

KEY: context

23 ANS:

$$A(t) = 1200\left(1 + \frac{6.4\%}{4}\right)^{4t} \quad \text{Barnyard because } A(10) \approx 2264.28$$

$$3 = e^{6.35\% t}$$

$$B(18) = 2264.43$$

$$\ln 3 = \ln e^{6.35\% t}$$

$$B(t) = 1200e^{6.35\% t}$$

$$\ln 3 = 0.635t$$

$$\frac{\ln 3}{0.635} = \frac{0.635t}{0.635}$$

$$t \approx 17.3$$

REF: 082437aII NAT: F.LE.A.4 TOP: Exponential Growth