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REGENTS BY TYPE

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

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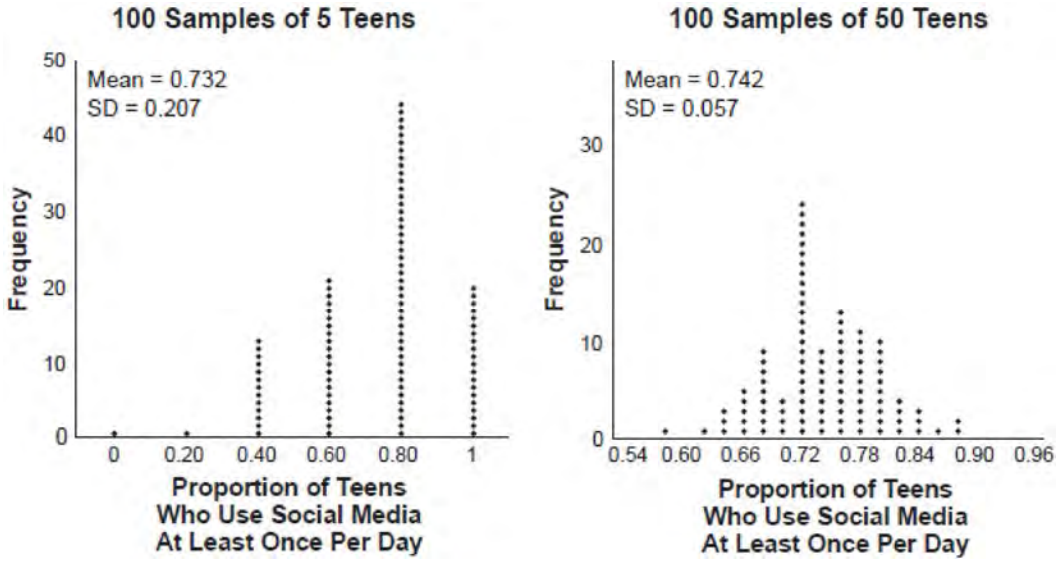
Algebra II Multiple Choice Regents Exam Questions

1 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.

2 The solution to the equation $6\left(2^{x+4}\right) = 36$ is

1) -1
2) $\frac{\ln 36}{\ln 12} - 4$
3) $\ln(3) - 4$
4) $\frac{\ln 6}{\ln 2} - 4$

3 Mary would like to determine if there is an association between a student's height and shoe size. She measures the height and shoe size of every 10th person entering her school. This is an example of

1) a census
2) an observational study
3) a simulation
4) a controlled experiment

4 The probabilities that a randomly selected teenager uses social media websites *F* and *I* are shown below.

$P(F) = 0.71$

$P(I) = 0.52$

$P(F \text{ or } I) = 0.77$

Given this information, what is $P(F \text{ and } I)$, the probability that a randomly selected teenager uses both websites?

1) 0.06
2) 0.19
3) 0.46
4) 0.96

5 The graph of $y = 2^x - 4$ is positive on which interval?
1) $(-\infty, \infty)$
2) $(2, \infty)$
3) $(0, \infty)$
4) $(-4, \infty)$

6 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) $(-3, -33)$

7 Given i is the imaginary unit and $a = i^3$, $b = i^2$, and $c = i$, which expression is equivalent to $2ax^2 + 3bx - cx$?
1) $-2ix^2 - 3x + ix$
2) $-2ix^2 - 3ix$
3) $-2ix^2 - 3x - ix$
4) $-8ix^3 - 3x - ix$

8 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%

9 What is the seventh term of the sequence $-2, 6, -18, 54, \ldots$?
1) −1458
2) −4374
3) 1458
4) 4374

10 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) $c(x) = 14.6x^2 + 730x - 1260$

11 If $f(x) = \frac{1}{2}x^3 + 3x^2 - 4x$ and $g(x) = 5\log_3(x + 10)$, then which value, rounded to the *nearest tenth*, is *not* a solution to $f(x) = g(x)$?
1) −6.9
2) −1.4
3) 2.2
4) 9.8

12 In order to qualify for a college tennis scholarship, Joe needs to win 90% of the matches he plays during his senior year of high school. If he has won 8 of the 10 matches that he has played, which equation can be used to determine how many more consecutive matches, x, Joe must win in order for his winning percentage to equal 90%?
1) $\frac{8+x}{x} = 0.90$
2) $\frac{8}{10+x} = 0.90$
3) $\frac{8}{10} + x = 0.90$
4) $\frac{8+x}{10+x} = 0.90$

13 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

14 The cost, in dollars, of a single-ride fare in the New York City subway in the years since 1904 is listed in the table below.

Years since 1904 (x)	0	49	72	91	99	111
Fare (y)	\$0.05	\$0.15	\$0.50	\$1.50	\$2.00	\$2.75

Which equation best models the cost of a single-ride fare based on these data?

1) $y = 0.0375(1.0392)^x$
2) $y = 1.0392(0.0375)^x$
3) $y = 0.0234x - 0.487$
4) $y = -0.179 + 0.356\ln(x)$

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

1) –23
2) –7
3) 13
4) 29

16 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) $\frac{\sqrt{3}}{2}$

17 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) $6x^3 - 8x^2 + 16x - 31 + \frac{262}{x+2}$

18 The equation $\frac{1}{x} - \frac{1}{5} = \frac{x}{5}$ has

1) rational solutions
2) irrational solutions
3) imaginary solutions
4) no solutions

19 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) $(-2, 0.75)$

20 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) $x^3 - 2$

21 Which statement best describes the end behavior of the function $y = \log(x - 3)$?

1) As $x \to -\infty, y \to -\infty$, and as $x \to \infty, y \to \infty$.
2) As $x \to 3, y \to -\infty$, and as $x \to \infty, y \to \infty$.
3) As $x \to -\infty, y \to 0$, and as $x \to \infty, y \to \infty$.
4) As $x \to 3, y \to 0$, and as $x \to \infty, y \to \infty$.

22 Reynaldo got a score of 40 on his first test. If he gets a score of 100 on every additional test, which equation can be used to determine the number of additional tests, x, he would need to take in order to raise his test average to an 80?

1) $\frac{40 + 100x}{x + 1} = 80$
2) $\frac{40 + 100x}{x} = 80$
3) $\frac{40 + 100 + x}{x} = 80$
4) $\frac{40 + 100 + x}{x + 1} = 80$

23 A study of the red tailed hawk population in a given area shows the population, $H(t)$, can be represented by the function $H(t) = 50(1.19)^t$ where t represents the number of years since the study began. In terms of the monthly rate of growth, the population can be best approximated by the function

1) $H(t) = 50(1.015)^{12t}$
2) $H(t) = 50(1.15)^{\frac{t}{12}}$
3) $H(t) = 50(1.19)^{12t}$
4) $H(t) = 50(1.19)^{\frac{t}{12}}$

24 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) $\frac{10}{21}$

25 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

26 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

27 What is the inverse of $f(x) = 2x + 6$?

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

28 The function $P(t) = 256,485(0.965)^t$ models the decreasing population of a city from 1999 to 2014, where t is the time in years since 1999. Which statement is *not* true?

1) The function estimated the population was 256,485 in 1999.
2) The decay rate was 0.35%.
3) The decay factor is 0.965.
4) The population declined over 15 years.

29 When factored completely, $(3x - 1)^2 - 5(3x - 1) + 6$ is equivalent to

1) $(3x - 3)(3x - 4)$
2) $3x(3x - 7)$
3) $3(x - 1)(3x - 4)$
4) $(3x + 1)(3x - 2)$

30 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) $P = 210xy^2\sqrt[3]{x^3y^5}$

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

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

32 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) $\log_{\frac{1}{2}}(q) = p$

33 For $x > 0$, which expression is equivalent to $\sqrt[3]{9x^2} \bullet \sqrt{9x}$?

1) $9^5 x^{\frac{7}{2}}$
2) $9^6 x^3$
3) $9^{\frac{1}{6}} x^{\frac{1}{3}}$
4) $9^{\frac{5}{6}} x^{\frac{7}{6}}$

34 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) $-4x^2 - 17x + 47$

35 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

36 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 test scores. This method of data collection is best described as

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

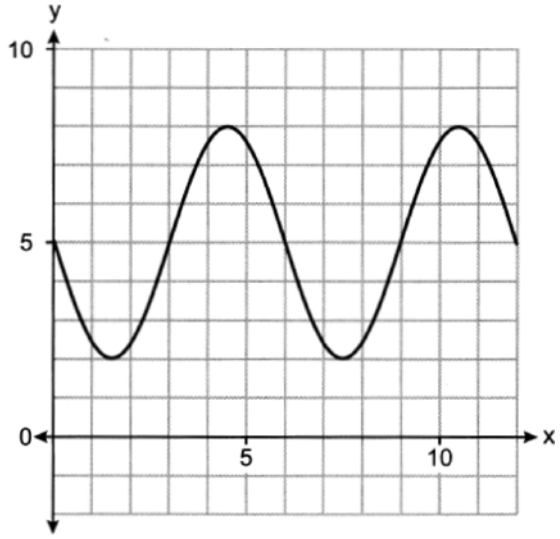
37 What is the exact value of $\tan\left(-\frac{5\pi}{6}\right)$?

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

38 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) $4 - \frac{4}{x^2 - 1}$

39 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) $y = -5\cos\left(\frac{\pi}{3}x\right) + 3$

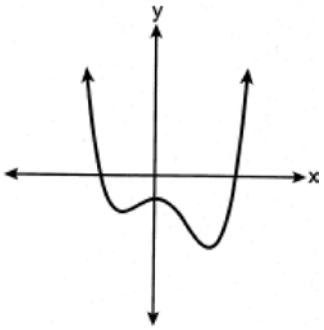
40 The solution set to the equation $\frac{2}{x^3} + \frac{1}{x} = \frac{6}{x^3}$ is

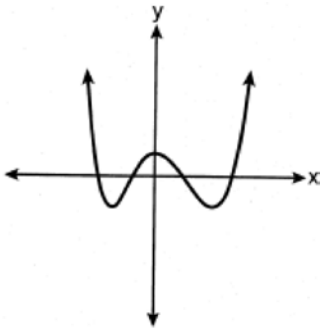
1) $\{-2, 0, 2\}$
2) $\{2\}$
3) $\{-2, 2\}$
4) $\{0, 2\}$

41 The expression $\sqrt[3]{16x^6}$ is equivalent to

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

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

1)


2)


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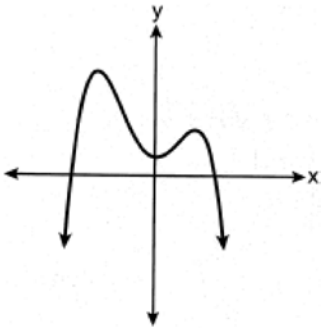

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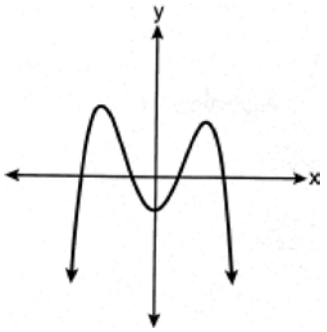


43 A random sample of 152 students was surveyed on a particular day about how they got to school. The survey results are summarized in the table below.

		Attendance Status	
		Late	On-Time
Method of Transportation	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.

44 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) $y = 3\sin(\pi x) + 9$

45 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

46 For all values for which the expressions are defined, which expression can *not* be rewritten as $(x-6)(x+2)$?

1) $\frac{(x+2)(x^2-2x-24)}{(x+4)}$
2) $x(x+2) - 6(x+2)$
3) $\frac{(x-2)(x^2-4x-12)}{(x-6)}$
4) $(x+4)(x-2) - 2(3x+2)$

47 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

48 Given $y = -2x$ and $x^2 + y^2 = 5$, the point of intersection in Quadrant II is

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

49 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

50 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) $\frac{1}{\sqrt[3]{x^2}}$

51 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) $x(x^2-9)(x+4)(x+4)$

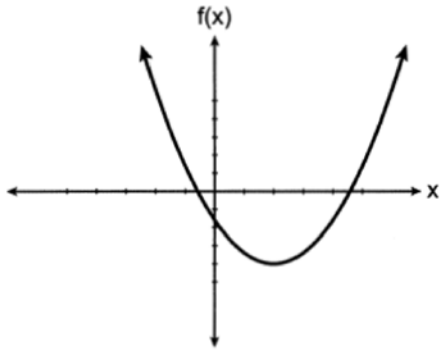
52 Beginning July 1, 2019, Michelle deposited $250 into an account that yields 0.15% each month. She continued to make $250 deposits into this account on the first of each month for 3 years. Which expression represents the amount of money that was in the account after her last deposit was made on June 1, 2022?
1) $250(1.0015)^3$
2) $250(1.0015)^{36}$
3) $\frac{250 - 250(1.0015)^3}{1 - 1.0015}$
4) $\frac{250 - 250(1.0015)^{36}}{1 - 1.0015}$

53 Which investigation technique is most often used to determine the cause and effect of a medication?
1) observational study
2) survey
3) controlled experiment
4) census

54 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) $a_0 = 5000$
$a_n = a_{n-1}(1.035)$

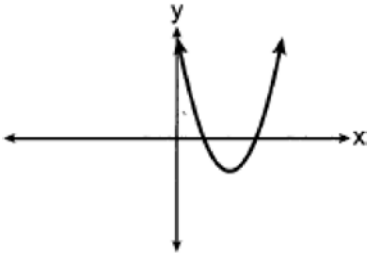
55 The solutions to the equation $3x^2 - 4x + 2 = 2x - 3$ are
1) $\frac{2}{3} \pm \frac{\sqrt{2}}{3}i$
2) $1 \pm \frac{\sqrt{6}}{3}i$
3) $1 \pm \frac{\sqrt{12}}{3}$
4) $1 \pm 2\sqrt{6}i$

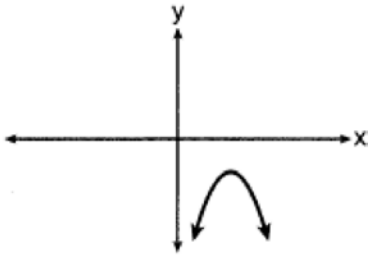
56 If $f(x)$ is represented by the graph below, which translation of $f(x)$ would have imaginary roots?

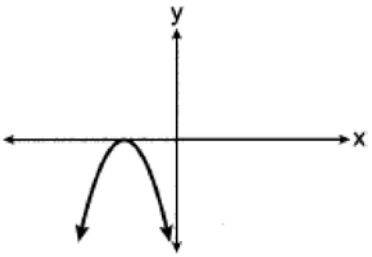


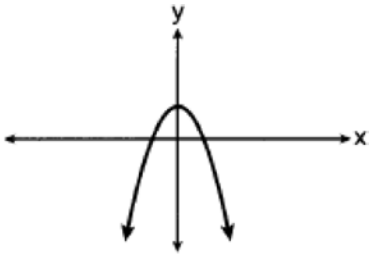
1) $f(x+5)$
2) $f(x-5)$
3) $f(x)+5$
4) $f(x)-5$

57 Which graph has imaginary roots?

1) 

2) 

3) 

4) 

58 Given $m \neq 0$ and $\left(17^{\frac{1}{m}}\right)^{n} = 17^{2}$, what is n in terms of m?

1) $2m$
2) $\frac{2}{m}$
3) $\frac{m}{2}$
4) 2^{m}

59 Which expression is equivalent to $2c\sqrt[3]{c}$?

1) $2c^{\frac{4}{3}}$
2) $2c^{\frac{3}{4}}$
3) $(2c)^{\frac{4}{3}}$
4) $(2c)^{\frac{3}{4}}$

60 The result of dividing $2x^3 + 6x^2 + 7x + 2$ by $x + 1$ is

1) $2x^2 + 4x + 3 - \frac{1}{x+1}$
2) $2x^2 + 4x + 3 + \frac{5}{x+1}$
3) $2x^2 + 8x - 15 + \frac{17}{x+1}$
4) $2x^2 + 8x + 15 - \frac{13}{x+1}$

61 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

62 The black bear population for a certain area of the Adirondacks can be modeled by the equation $B = 5835.943(1.026)^t$, where t is measured in years since 2010. Kieran would like to rewrite this model in terms of a 5-year growth rate. Kieran's model is best represented by

1) $B = 5835.943(1.005147)^{\frac{t}{5}}$
2) $B = 5835.943(1.005147)^{5t}$
3) $B = 5835.943(1.136938)^{\frac{t}{5}}$
4) $B = 5835.943(1.136938)^{5t}$

63 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) $\frac{7}{8} \pm \frac{\sqrt{143}}{8} i$

64 A vehicle's depreciation rate is 9.2% per year. If a vehicle costs \$34,950, then which recursive formula models the value of the vehicle n years after it was purchased?

1) $a_n = 34,950(1.092)^n$
2) $a_n = 34,950(0.921)^n$
3) $a_0 = 34,950$
   $a_n = 1.092a_{n-1}$
4) $a_0 = 34,950$
   $a_n = 0.908a_{n-1}$

65 The solution set of the equation $x - 1 = \sqrt{2x + 6}$ is

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

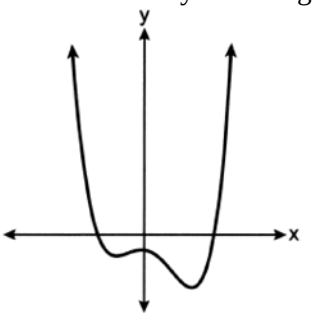
66 Abby is told that each day there is a 50% chance it will rain. Which simulation can Abby perform to determine the likelihood of it raining for the next seven days?

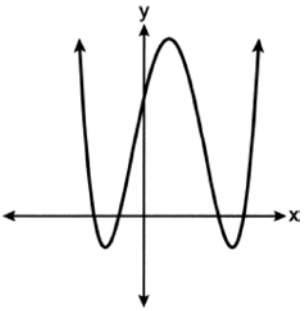
1) Flip a coin seven times, count how many heads, and repeat 50 times.
2) Roll a die seven times, count how many twos, and repeat 50 times.
3) Roll a pair of dice, count totals of seven, and repeat 50 times.
4) Flip a coin 50 times and count how many heads.

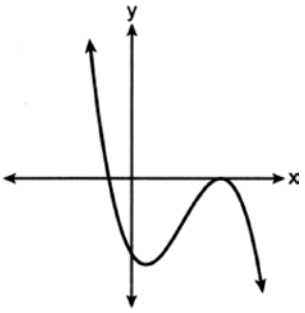
67 The roots of the equation $0 = x^2 + 6x + 10$ in simplest $a + bi$ form are

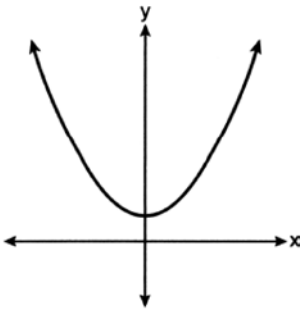
1) $-3 \pm 2i$
2) $-6 \pm i$
3) $-3 \pm i$
4) $-3 \pm i\sqrt{2}$

68 Which graph shows a fourth-degree polynomial function with exactly two imaginary roots?

1) 

2) 

3) 

4) 

69 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 $P(N) \bullet P(W) = P(N \cap W)$.
2) Yes, because $P(N) \bullet P(W) \neq P(N \cap W)$.
3) No, because $P(N) \bullet P(W) = P(N \cap W)$.
4) No, because $P(N) \bullet P(W) \neq P(N \cap W)$.

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

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

71 The point $(2,-3)$ lies on the graph of the equation $y = f(x)$. Which point must lie on the graph of the equation $y = f(x-4)+1$?

1) $(1,1)$
2) $(-2,-2)$
3) $(3,-7)$
4) $(6,-2)$

72 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

73 Which binomial is a factor of $g^3 + 6g^2 + g - 14$?

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

74 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) 24π
3) $\frac{\pi}{12}$
4) 6π

75 Given $x \neq 0$, where $m(x) = 12x^{8a}$ and $p(x) = 3x^{2a}$, the expression $\frac{m(x)}{p(x)}$ is equivalent to

1) $9x^{4a}$
2) $4x^{6a}$
3) $4x^{6}$
4) $4x^{4}$

76 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

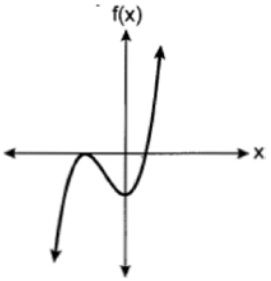
1) 411
2) 612
3) 1748
4) 2360

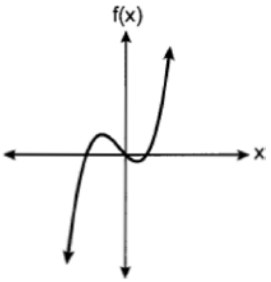
77 The solution of $\frac{x}{x+3} + \frac{2}{x-4} = \frac{2x+27}{x^2-x-12}$ is

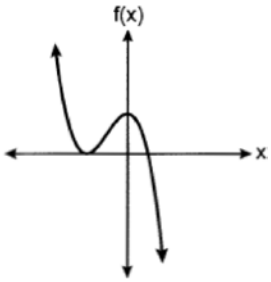
1) –3
2) –7
3) 3
4) 7

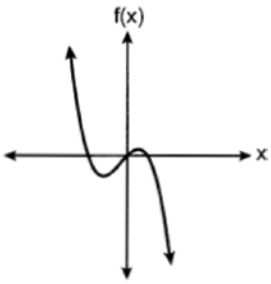
78 A grocery store owner wonders how many customers bring reusable bags to the store. An employee stands at the store entrance for two hours and counts the number of people bringing in reusable bags. This type of study is best classified as
1) a census
2) an experiment
3) an observational study
4) a survey

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

1) 

2) 

3) 

4) 

80 What is the solution to $9(e^{x-2}) = 36$?
1) $x = \frac{\ln(36)}{\ln(9e)} + 2$
2) $x = \ln(4) - 2$
3) $x = \ln(4) + 2$
4) $x = \ln\left(\frac{4}{e}\right) + 2$

81 If θ 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 $\tan\theta > 0$

82 Which expression is equivalent to $\frac{6x^3 + 7x^2 - 9x - 1}{2x - 1}$ when $x \neq \frac{1}{2}$?
1) $3x^2 - 2x - 4$
2) $3x^2 + 5x - 7 - \frac{8}{2x-1}$
3) $3x^2 + 2x + 5 - \frac{6}{2x-1}$
4) $3x^2 + 5x - 2 - \frac{3}{2x-1}$

83 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) $-\sqrt[3]{x} - 4$

84 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

85 The number of bacteria in a sample, which can be modeled by an exponential regression, is shown in the table below.

Time Since Observation Began (hours)	0	1	2	3.5	4
Number of Bacteria	40	48	57	75	82

Assuming this trend continues, approximately how many bacteria would be present 8 hours after the observation began?

1) 123
2) 127
3) 168
4) 180

86 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) $\pm 3i, -3, 4$

87 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) $1000(3)^{\frac{t}{10}}$

88 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.

89 What is one solution to the system of equations shown below?

$$x^2 + y^2 = 20$$
$$y = x - 6$$

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

90 Given $f(x) = \ln(x + 5)$, what is the *smallest* integer value of x for which $f(x)$ is defined?

1) -5
2) -4
3) -1
4) 0

91 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

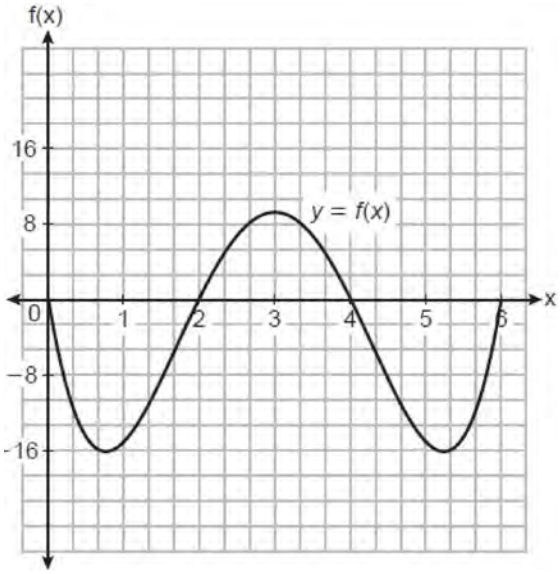
92 Tim deposits \$300 into a savings account. The annual interest rate is 2.7% and compounds monthly. He uses the equation $A = 300\left(1 + \frac{0.027}{12}\right)^{12t}$ to determine how much money he will have after t years. Which equation is equivalent to Tim's equation?

1) $A = 300\left[(1.00225)^{12}\right]^{t}$
2) $A = 300(0.08558)^{12t}$
3) $A = 300\left[1 + \left(\frac{0.027}{12}\right)^{12t}\right]$
4) $A = (300)^{12t}(1)^{12t} + \left(\frac{0.027}{12}\right)^{12t}$

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

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

94 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

95 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) $2x^3 - 6x^2 + 13x - 36 + \frac{106}{x-3}$

96 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

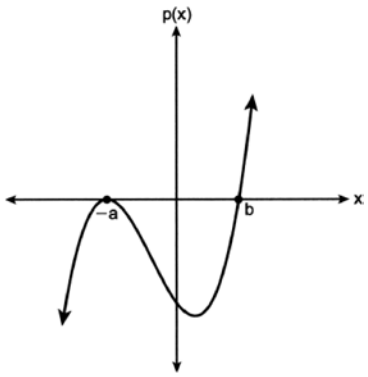
97 The average cost of a gallon of milk in the United States between the years of 1995 and 2018 can be modeled by the equation $P(t) = -0.0004t^3 + 0.0114t^2 - 0.0150t + 2.6602$, where $P(t)$ represents the cost, in dollars, and t is time in years since January 1995. During this time period, in what year did $P(t)$ reach its maximum?

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

98 What is the solution to $5(2)^{19x} = 50$?

1) $x = \frac{\log(50)}{19}$
2) $x = \frac{\log_2(10)}{19}$
3) $x = \frac{\log_2(45)}{19}$
4) $x = \frac{5}{19}$

99 A sketch for $p(x)$ is shown below, where $a > 0$ and $b > 0$.



An equation for $p(x)$ could be

1) $p(x) = (x + a)(x - b)$
2) $p(x) = (x + a)^2(x - b)$
3) $p(x) = (x - a)(x + b)$
4) $p(x) = (x - a)^2(x + b)$

100 Which sequence has a common ratio of $\frac{1}{2}$?

1) $-\frac{1}{4}a, -\frac{1}{8}a, -\frac{1}{16}a, -\frac{1}{32}a, \ldots$
2) $\frac{1}{32}a, \frac{1}{16}a, \frac{1}{8}a, \frac{1}{4}a, \ldots$
3) $20a, \frac{39}{2}a, 19a, \frac{37}{2}a, \ldots$
4) $22a, 22.5a, 23a, 23.5a, \ldots$

101 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) $p(5) \neq 0$

102 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) $(x - 2)(x + 25)(x - 90)$

103 Given $f(x) = x^3 - 3$ and $f^{-1}(x) = \sqrt[3]{x - 3b}$, the value of b is

1) 1
2) –1
3) 3
4) –3

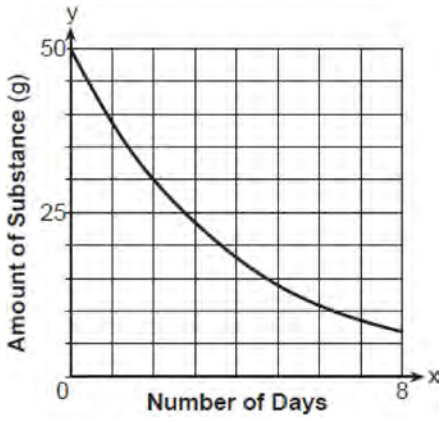
104 Given 3 is a root of $f(x) = x^4 - x^3 - 21x^2 + 45x$, what are the other unique roots of $f(x)$?

1) –5, only
2) –5 and 0
3) –3, 1 and 5
4) –5, –3 and 0

105 The solution set for the equation $x + 1 = \sqrt{4x + 25}$ is

1) { }
2) {6}
3) {6, –4}
4) {–4}

106 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%

107 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) $2x^3 - 9x^2 + 22x - 78$

108 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) $x + 5$

109 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) $V(x) = 4x^3 + 324x$

110 Which expression is equivalent to $(x+3)^2 + 4(x+3) - 5$?

1) $(x+5)(x-1)$
2) $(x+8)(x+2)$
3) $(x-2)(x+4)$
4) $x^2 + 4x + 16$

111 The expression $8^{\frac{x}{2}} \bullet 8^{\frac{x}{3}}$ is equivalent to

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

112 Consider the recursively defined sequence below.

$$a_1 = 8$$

$$a_n = 2a_{n-1}$$

Which explicit formula represents the same sequence?

1) $a_n = 2^n$
2) $a_n = 2(4^n)$
3) $a_n = 2^{n+2}$
4) $a_n = 8^n$

113 The number of hours in the lifespan of a certain brand of light bulb is normally distributed with a mean of 2387 hours and a standard deviation of 238 hours. To the *nearest tenth of a percent*, what percent of light bulbs have a lifespan of greater than 2750 hours?

1) 6.4%
2) 15.9%
3) 43.6%
4) 93.6%

114 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

115 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)

116 At a high school, 10th-grade students were recently asked if they walk to school and if they eat breakfast. The survey results are summarized in the table below.

	Walks to School	**Doesn't Walk to School**
Eats Breakfast	7	53
Doesn't Eat Breakfast	10	30

What is the probability that a randomly selected 10th-grade student from the school walks to school or eats breakfast?

1) 0.07
2) 0.70
3) 0.77
4) 0.84

117 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) $A(t) = 150(1.00283)^{7t}$

118 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) $2x^7y^4$

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

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

120 For $x \neq \pm 4y$, the expression $\frac{x^2 + 3xy - 28y^2}{16y^2 - x^2}$ is equivalent to

1) $-1 - \frac{7}{4}y$
2) $\frac{x - 7y}{4y - x}$
3) $\frac{x + 7y}{x + 4y}$
4) $\frac{-x - 7y}{x + 4y}$

121 Josie examines the graphs of $f(x) = 3^x - 8$ and $g(x) = \frac{1}{x^2 - 4}$. The number of solutions to $f(x) = g(x)$ is

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

122 Four different surveys gathered data about the purchasing behaviors of pet owners. Pet owners from the same population were randomly selected. While collecting data, Chris surveyed 942 pet owners, John surveyed 410, Brooke surveyed 800, and Shane surveyed 100. Whose survey will likely have the *smallest* margin of error?

1) Brooke
2) Chris
3) John
4) Shane

123 Consider $f(x) = (x-2)^2(x+3)$, and $g(x)$ as strictly defined in the table below.

x	g(x)
−3	0
−2	1
−1	−2
0	−6
1	−1
2	0

Which statement or statements must be true, based on the information given?

I. Both $f(x)$ and $g(x)$ have the same x-intercepts.

II. Both $f(x)$ and $g(x)$ have a y-intercept at $y = -6$.

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

124 Given $E(t) = 26(2)^{\frac{t}{20}}$ represents the mass, in grams, of a substance after t minutes in a laboratory, which statement or statements must be true?

I. The initial mass of the substance is 26 grams.

II. The mass of the substance doubles every 20 days.

III. The mass of the substance after 3 hours is approximately 29 grams.

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

125 The number of people who have read an article grows exponentially throughout the day and can be modeled by the function $N(t) = 2(1.0098)^t$, where t represents the number of minutes since the article has been posted. Which equation best represents the number of people who have read the article in terms of the growth rate per second?

1) $N(t) = 2(1.000163)^{\frac{t}{60}}$
2) $N(t) = 2(1.000163)^{60t}$
3) $N(t) = 2(1.79524)^{\frac{t}{60}}$
4) $N(t) = 2(1.79524)^{60t}$

126 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) $\frac{1}{5}\left(\frac{\log 12}{\log 4} + 2\right)$

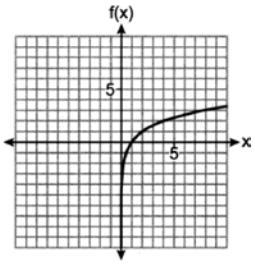
127 Given i is the imaginary unit, which expression is equivalent to $5i(2x+3i) - x\sqrt{-9}$?

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

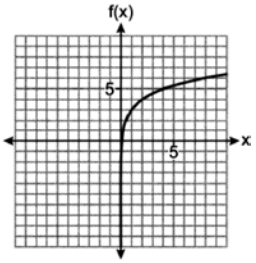
128 Which expression is equivalent to $x^8 - y^8$?

1) $(x-y)^8$
2) $(x^2+y^2)^2(x^2-y^2)^2$
3) $(x^4+y^4)(x^2+y^2)(x+y)(x-y)$
4) $(x+y)^4(x-y)^4$

129 The graph of $f(x)$ is shown below.



Which graph represents $f(x+3)$?

1)


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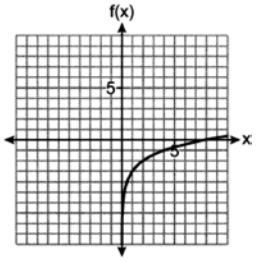
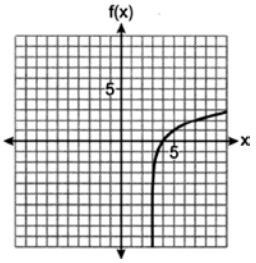
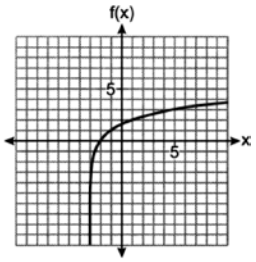


3)


4)


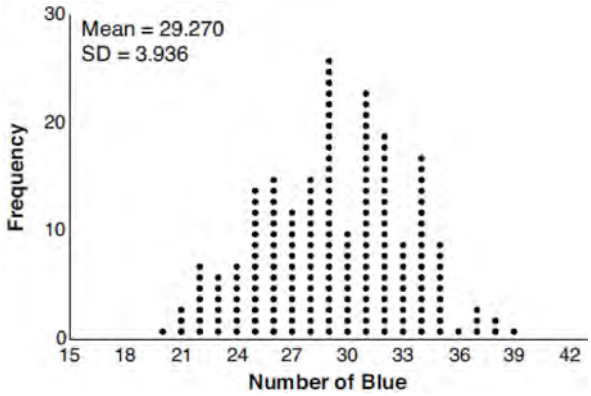
130 The expression $i^2(5x-2i)^2$ is equivalent to

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

131 The seventh term of the geometric sequence $\sqrt{6},-2\sqrt{3},2\sqrt{6},-4\sqrt{3}\ldots$ is

1) $6\sqrt{6}$
2) $-6\sqrt{3}$
3) $8\sqrt{6}$
4) $-8\sqrt{3}$

132 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.

Algebra II Multiple Choice Regents Exam Questions

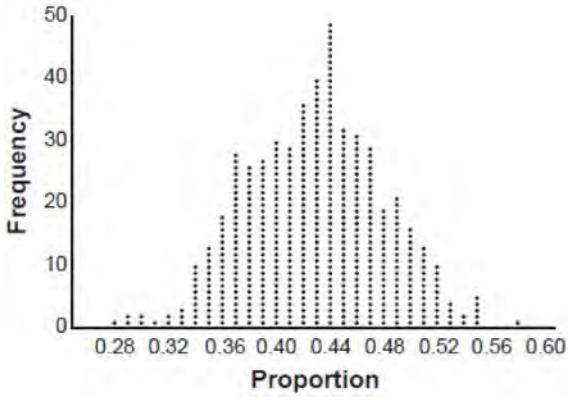
133 Consider the data in the table below.

	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) $\frac{13}{24}$

134 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

135 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) $x^2+10x-6=0$

136 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.

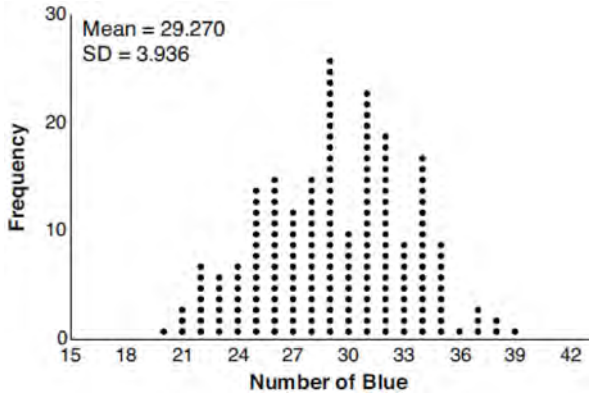
137 The solution set of $\frac{x+3}{x-5}+\frac{6}{x+2}=\frac{6+10x}{(x-5)(x+2)}$ is

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

138 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) $\{-5,-3,2,3\}$

139 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.



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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.

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

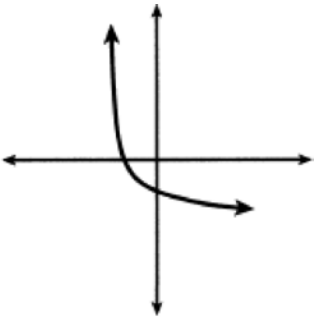
1) $\{-5, 8\}$
2) $\{8\}$
3) $\{-4, 10\}$
4) $\{\ \}$

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

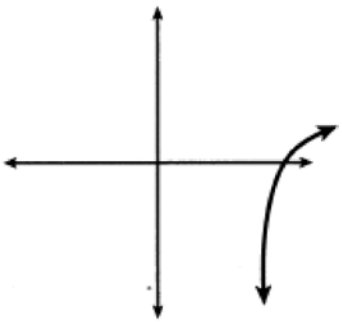
1) $f(x) \to -1$
2) $f(x) \to 0$
3) $f(x) \to 2$
4) $f(x) \to -\infty$

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

1)



2)



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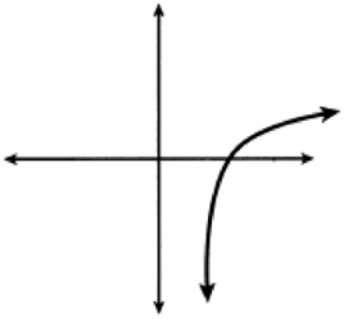
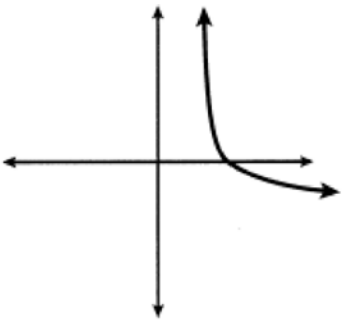


4)



143 The table below shows the food preferences of sports fans whose favorite sport is football or baseball.

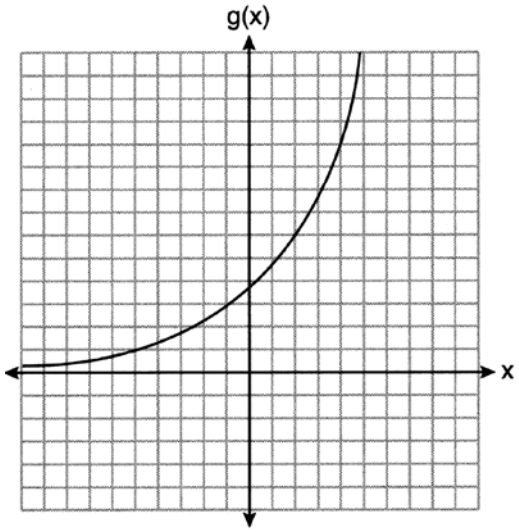
Favorite Food to Eat While Watching Sports

	Wings	Pizza	Hot Dogs
Football	14	20	6
Baseball	6	12	42

The probability that a fan prefers pizza given that the fan prefers football is

1) $\frac{1}{2}$
2) $\frac{1}{5}$
3) $\frac{5}{8}$
4) $\frac{13}{25}$

144 Consider the graph of g and the table representing t below.



x	t(x)
–1	3
0	5
1	2
2	–5
3	–1
4	3

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.

145 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) $f^{-1}(x) = \frac{x}{12} + 4$

146 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) $s(x) = 4^{\frac{x}{2}}$

147 The population of Austin, Texas from 1850 to 2010 is summarized in the table below.

Year	1850	1870	1890	1910	1930	1950	1970	1990	2010
Population	629	4428	14,575	29,860	53,120	132,459	251,808	494,290	790,390

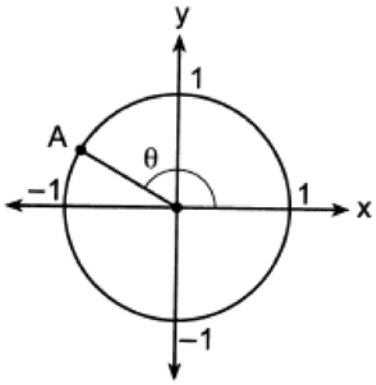
Over which period of time was the average rate of change in population the greatest?

1) 1850 to 1910
2) 1990 to 2010
3) 1950 to 1970
4) 1890 to 1970

148 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) $\{1\}$

149 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 θ intersects the unit circle.



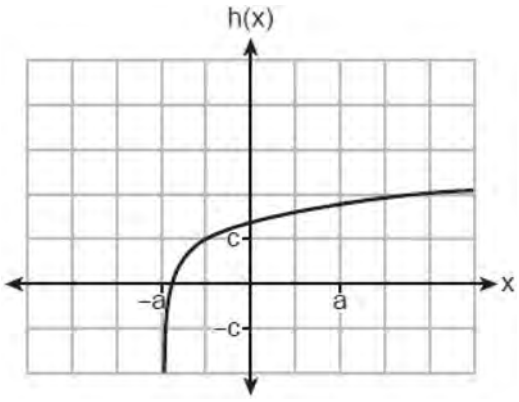
What is m$\angle\theta$?

1) 30°
2) 120°
3) 135°
4) 150°

150 Which investigation technique is most often used to determine if a single variable has an impact on a given population?

1) observational study
2) random survey
3) controlled experiment
4) formal interview

151 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) $h(x)=\log(x-a)-c$

152 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) $f^{-1}(x)=2x+2$

153 Which expression is an equivalent form of $a\sqrt[5]{a^4}$?

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

154 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) $R(n) = 1200(1.002)^{12n} - 100n$

155 Consider a cubic polynomial with the characteristics below.

- exactly one real root
- as $x \to \infty$, $f(x) \to -\infty$

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) $f(x) = (x-a)(b-x^2)$

156 The element Americium has a half-life of 25 minutes. Given an initial amount, A_0, which expression could be used to determine the amount of Americium remaining after t minutes?

1) $A_0\left(\frac{1}{2}\right)^{\frac{t}{25}}$
2) $A_0(25)^{\frac{t}{2}}$
3) $25\left(\frac{1}{2}\right)^t$
4) $A_0\left(\frac{1}{2}\right)^{25t}$

157 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) $x^4 + 4x^2 - 9$

158 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 $R(x) = x \bullet S(x)$. 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) $0.18x^3 + 5.98x^2 + 99.4x + 180$

159 If θ is an angle in standard position whose terminal side passes through the point $(-2,-3)$, what is the numerical value of $\tan\theta$?

1) $\frac{2}{3}$
2) $\frac{3}{2}$
3) $-\frac{2}{\sqrt{13}}$
4) $-\frac{3}{\sqrt{13}}$

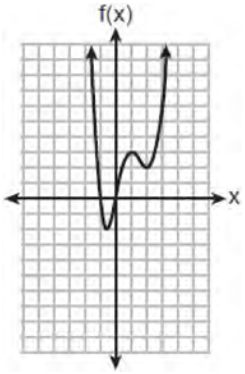
160 The expression $\frac{x^2+12}{x^2+3}$ can be rewritten as

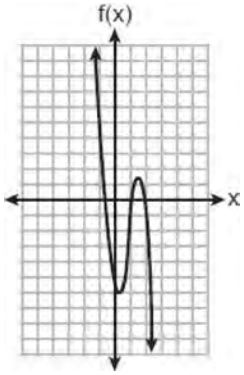
1) $\frac{10}{x^2+3}$
2) $1 + \frac{9}{x^2+3}$
3) $x + 9$
4) 4

161 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) $1 + \frac{2}{x^2+4}$

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

1) 

2) 

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

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

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

164 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) $(3 + 3x^2) - 7i$

165 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 $(0, -4)$.

166 The solution set for the equation $\sqrt{3(x+6)} = x$ is

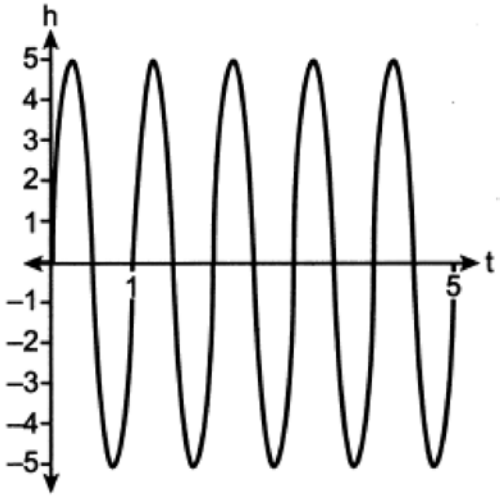
1) $\{6, -3\}$

2) $\{-6, 3\}$

3) $\{6\}$

4) $\{-3\}$

167 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) 2π

3) 60

4) $\frac{\pi}{30}$

168 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) $\frac{x}{80+x}=\frac{90}{100}$

169 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) $P=12{,}150(0.998)^d$

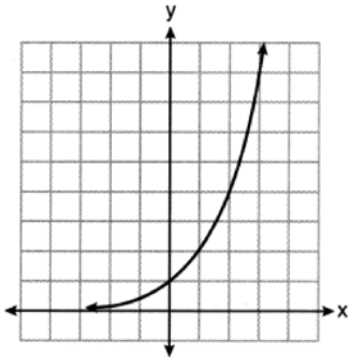
170 Which value, to the *nearest tenth*, is the *smallest* solution of $f(x)=g(x)$ if $f(x)=3\sin\left(\frac{1}{2}x\right)-1$ and $g(x)=x^3-2x+1$?

1) –3.6
2) –2.1
3) –1.8
4) 1.4

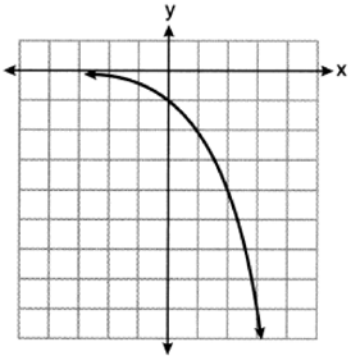
171 Given $x \neq -3$, which expression is equivalent to $\frac{2x^3+3x^2-4x+5}{x+3}$?

1) $2x^3+9x^2+23x+74$
2) $2x^2-3x+5-\frac{10}{x+3}$
3) $2x^3-3x^2+5x-10$
4) $2x^2+9x+23+\frac{74}{x+3}$

172 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) $y=h(-x)$

173 The roots of the equation $x^2-4x=-13$ are

1) $2\pm 3i$
2) $2\pm 6i$
3) $2\pm\sqrt{17}$
4) $2\pm\sqrt{13}$

174 What is the total number of points of intersection of the graphs of the equations $y=e^x$ and $xy=20$?

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

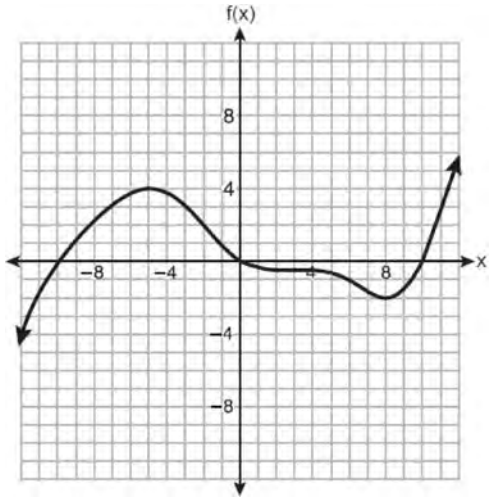
175 In a group of 40 people, 20 have brown hair, 22 have blue eyes, and 15 have both brown hair and blue eyes. How many people have neither brown hair nor blue eyes?
1) 0
2) 13
3) 27
4) 32

176 The 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

177 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) $(-10, 0)$

178 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

179 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) $2x^2 - 12x - 18$

180 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

181 The function $N(x) = 90(0.86)^x + 69$ can be used to predict the temperature of a cup of hot chocolate in degrees Fahrenheit after x minutes. What is the approximate average rate of change of the temperature of the hot chocolate, in degrees per minute, over the interval $[0, 6]$?
1) –8.93
2) –0.11
3) 0.11
4) 8.93

182 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) $-2 + \ln(2)$

183 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** (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) $\frac{59,000 - 59,000(1.1)^5}{1 - 1.1}$

2) $\frac{59,000 - 59,000(0.1)^5}{1 - 0.1}$

3) $\sum_{n=1}^{5} 59,000(1.1)^n$

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

184 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) $\{0, 3\}$

185 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

186 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

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

1) –36
2) –3
3) 3
4) 6

188 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) $x^2 - 2x + 4 - \frac{10}{x-2}$

189 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%

190 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 $f(x)$

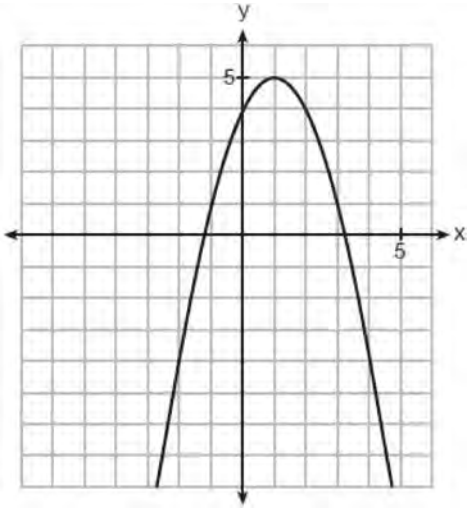
191 Audra is interested in studying the number of students entering kindergarten in the Ahlville Central School District over the next several years. Using data dating back to 2015, she determines that the number of kindergarteners is decreasing at an exponential rate. She creates a formula to model 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.

192 The expression $\left(a\sqrt[3]{2b^2}\right)\left(\sqrt[3]{4a^2b}\right)$ is equivalent to

1) $2ab\sqrt[3]{a^2}$
2) $2ab$
3) $2ab\sqrt[3]{2a^2}$
4) $2a^2b\sqrt[3]{2b}$

193 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) $(3,1)$

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

195 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

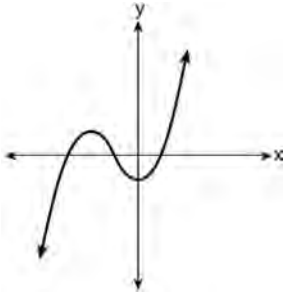
196 In watching auditions for lead singer in a band, Liem became curious as to whether there is an association between how animated the lead singer is and the amount of applause from the audience. He decided to watch each singer and rate the singer on a scale of 1 to 5, where 1 is the least animated 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

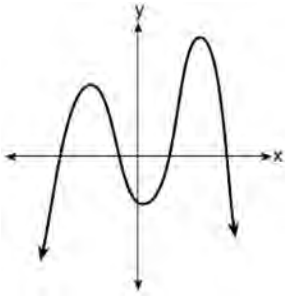
1) experimental
2) observational
3) a sample survey
4) a random assignment

197 Consider the end behavior description below.

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

Which function satisfies the given conditions?

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

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

198 Which function is even?

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

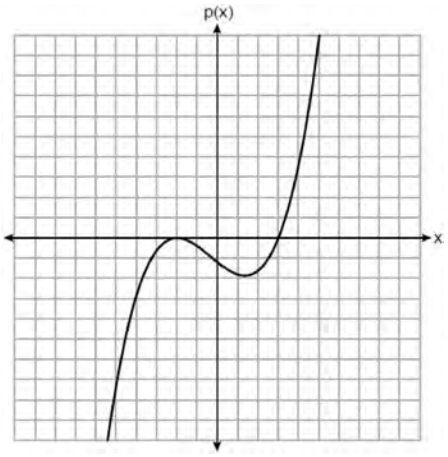
199 If a solution of $2(2x - 1) = 5x^2$ is expressed in simplest $a + bi$ form, the value of b is

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

200 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) $A(t) = A_0(1.08361)^t$

201 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) $x + 3$

202 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 $0 \le x \le 3$
4) $x > 3$, only

203 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.

204 Consider the following patterns:
I. $16, -12, 9, -6.75, \ldots$
II. $1, 4, 9, 16, \ldots$
III. $6, 18, 30, 42, \ldots$
IV. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots$
Which pattern is geometric?
1) I
2) II
3) III
4) IV

205 Which expression is equivalent to $(x + yi)(x^2 - xyi - y^2)$, where i is the imaginary unit?
1) $x^3 + y^3 i$
2) $x^3 - xy^2 - (xy^2 + y^3)i$
3) $x^3 - 2xy^2 - y^3 i$
4) $x^3 - y^3 i$

206 Which expression is a factor of $x^4 - x^3 - 11x^2 + 5x + 30$?
1) $x + 2$
2) $x - 2$
3) $x + 5$
4) $x - 5$

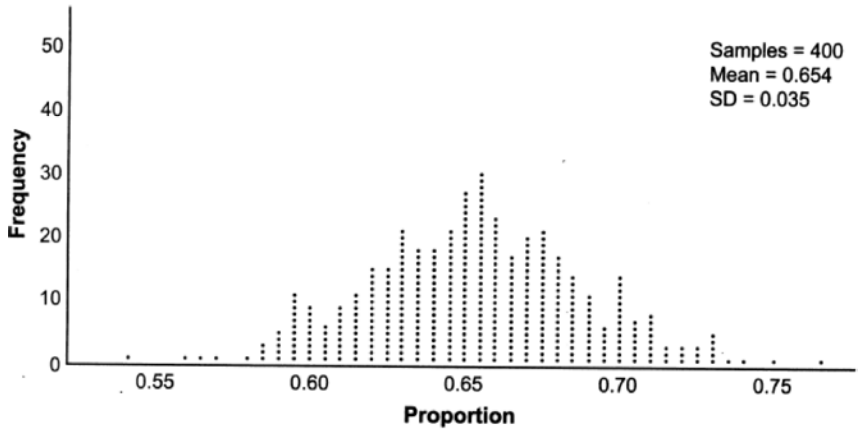
207 A population is normally distributed with a mean of 23 and a standard deviation of 1.2. The percentage of the population that falls below 21, to the *nearest hundredth*, is
1) 0.05
2) 4.78
3) 8.29
4) 91.30

208 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) $\frac{\ln 1.25}{0.025}$

209 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

210 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) $\sqrt[3]{x^{10}}$

211 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
2) 0.02
3) 0.05
4) 0.07

212 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) $S_{21} = \frac{500(1-0.04^{21})}{1-1.04}$

213 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

214 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 ± 5 and $-a$.
4) $f(x) = x^3 - ax^2 - 9x + 9a$ has zeros of ± 3 and a.

215 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.

216 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

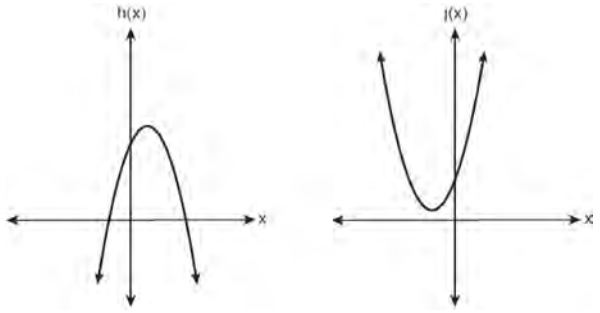
217 The average monthly temperature, $T(m)$, in degrees Fahrenheit, over a 12 month period, can be modeled by $T(m) = -23\cos\left(\frac{\pi}{6}m\right) + 56$, where m is in months. What is the range of temperatures, in degrees Fahrenheit, of this function?
1) $[-23, 23]$
2) $[33, 79]$
3) $[-23, 56]$
4) $[-79, 33]$

218 A recursive formula for the sequence $64, 48, 36, \ldots$ 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) $a_1 = 64$
$a_n = 0.75a_{n-1}$

219 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

220 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

221 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 $j(x)$

222 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

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

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

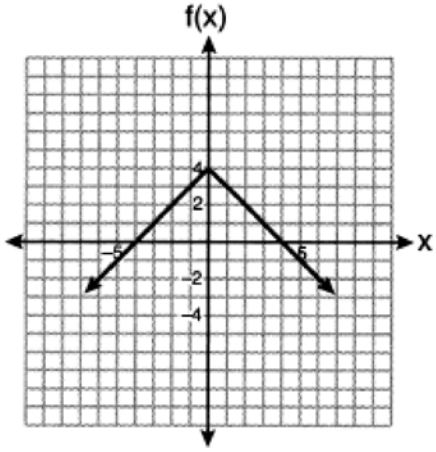
2) $x^2-1-\frac{3}{2x+4}$

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

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

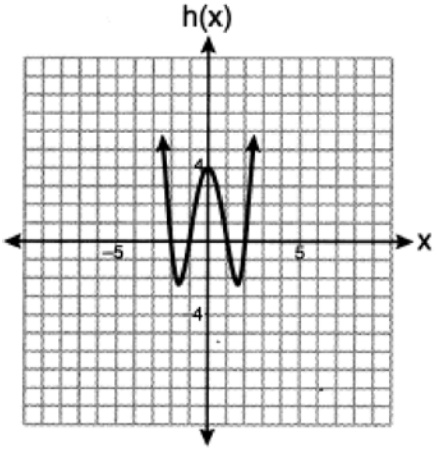
224 Which function has a maximum *y*-value of 4 and a midline of $y = 1$?

1)



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

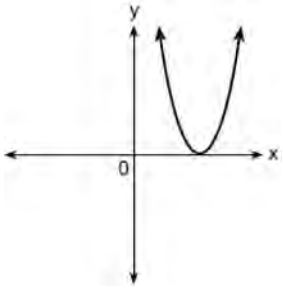
3)



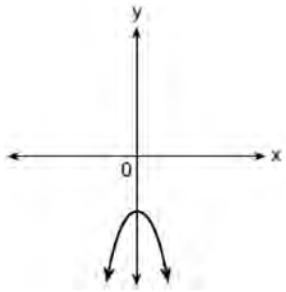
4) $j(x) = 4\sin(x) + 1$

225 Which graph shows a quadratic function with two imaginary zeros?

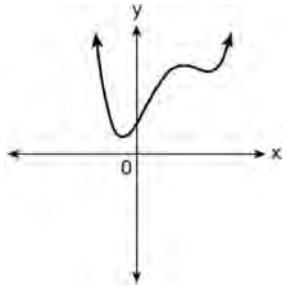
1)



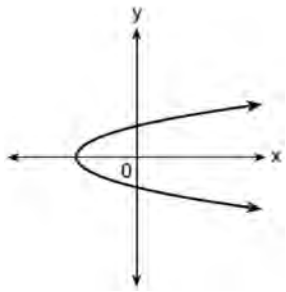
2)



3)



4)



226 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) $\frac{x(x-3)}{(3-x)}$

227 A popular celebrity tracks the number of people, in thousands, who have followed her on social media since January 1, 2015. A summary of the data she recorded is shown in the table below:

Number of Months Since January 2015	2	11	16	20	27	35	47	50	52
Number of Social Media Followers (thousands)	3.1	7.5	29.7	49.7	200.3	680.3	5200.3	8109.3	12,107.1

The celebrity uses an exponential regression equation to model the data. According to the model, about how many followers did she have on June 1, 2018?

1) 13,000,000
2) 5,420,000
3) 1,850,000
4) 790,000

228 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%

229 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) $\frac{3}{\sqrt{5}}$

230 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) $x^2-4xi-4$

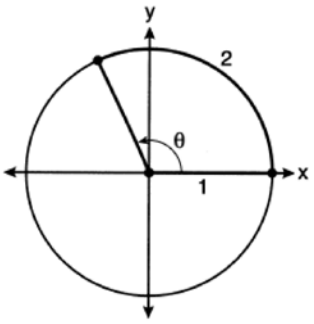
231 What is the value of $\tan\theta$ when $\sin\theta = \frac{2}{5}$ and θ is in quadrant II?

1) $\frac{-\sqrt{21}}{5}$
2) $\frac{-\sqrt{21}}{2}$
3) $\frac{-2}{\sqrt{21}}$
4) $\frac{2}{\sqrt{21}}$

232 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.

233 An angle, θ, 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 θ?

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

234 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) $9x^4y^2$

235 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) $a_n = 150(0.8)^n + 80$

236 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) $\left(x^3\right)^4$
4) $3\left(x^4\right)$

237 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

238 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) $x^2 + 4x - 15 + \frac{20}{x+3}$

239 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) $(x-6)(x+1)$

240 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

241 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.

242 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. $\frac{x^6\sqrt[4]{y^8}}{x^3y^3}$

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

243 A researcher wants to determine if room-darkening shades cause people to sleep longer. Which method of data collection is most appropriate?

1) census
2) survey
3) observation study
4) controlled experiment

244 Which function has the greatest y-intercept?

1) $f(x) = 4\sin(2x)$
2) $g(x) = 3x^4 + 2x^3 + 7$
3) $h(x) = 5e^{2x} + 3$
4) $j(x) = 6\log_2(3x + 4)$

245 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) $P(t) = 500(1.03)^{\frac{t}{12}}$

246 A recursive formula for the sequence $40, 30, 22.5, \ldots$ 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) $g_1 = 40$
   $g_n = \frac{3}{4}g_{n-1}$

247 As θ 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

248 What is the solution of $2(3^{x+4}) = 56$?

1) $x = \log_3(28) - 4$
2) $x = -1$
3) $x = \log(25) - 4$
4) $x = \dfrac{\log(56)}{\log(6)} - 4$

249 Given $x \neq -2$, the expression $\dfrac{2x^2 + 5x + 8}{x + 2}$ is equivalent to

1) $2x^2 + \dfrac{9}{x+2}$
2) $2x + \dfrac{7}{x+2}$
3) $2x + 1 + \dfrac{6}{x+2}$
4) $2x + 9 - \dfrac{10}{x+2}$

250 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) $x^2 + a^2 + 5x + 5a + 4$

251 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 $x \to \infty$, $f(x) \to \infty$.
4) $x \to -4$, $f(x) \to \infty$.

252 The sum of the first 20 terms of the series $-2 + 6 - 18 + 54 - \ldots$ is

1) –610
2) –59
3) 1,743,392,200
4) 2,324,522,934

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

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

254 Susan won $2,000 and invested it into an account with an annual interest rate of 3.2%. If her investment were compounded monthly, which expression best represents the value of her investment after t years?

1) $2000(1.003)^{12t}$
2) $2000(1.032)^{\frac{t}{12}}$
3) $2064^{\frac{t}{12}}$
4) $\dfrac{2000(1.032)^t}{12}$

255 Which expression is *not* equivalent to $36x^6 - 25y^4$?

1) $6^2(x^3)^2 - 5^2(y^2)^2$
2) $(6x^3 - 5y^2)(6x^3 + 5y^2)$
3) $(6x^6 - 5y^4)(6x^6 + 5y^4)$
4) $(3 \bullet 2x^3 - 5y^2)(3 \bullet 2x^3 + 5y^2)$

256 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

257 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) $f(x) = 35,000(1.0325)^{\frac{x}{12}}$

258 The expression $3i(ai - 6i^2)$ is equivalent to

1) $3a + 18i$
2) $3a - 18i$
3) $-3a + 18i$
4) $-3a - 18i$

259 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) $f\left(\frac{1}{2}\right) = 0$

260 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) $1 + \frac{1}{2x+6}$

261 Luminescence is the emission of light that is not caused by heat. A luminescent substance decays according to the function below.

$$I = I_0 e^{3\left(-\frac{t}{0.6}\right)}$$

This function can be best approximated by

1) $I = I_0 e^{\left(-\frac{t}{0.18}\right)}$
2) $I = I_0 e^{5t}$
3) $I = I_0 (0.0067)^t$
4) $I = I_0 (0.0497)^{0.6t}$

262 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

263 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) $x^3 + 2x^2 - 9x + 22 - \frac{30}{x+2}$

264 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

Algebra II Multiple Choice Regents Exam Questions

265 If $ae^{bt} = c$, where a, b, and c are positive, then t equals

1) $\ln\left(\frac{c}{ab}\right)$
2) $\ln\left(\frac{cb}{a}\right)$
3) $\frac{\ln\left(\frac{c}{a}\right)}{b}$
4) $\frac{\ln\left(\frac{c}{a}\right)}{\ln b}$

266 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

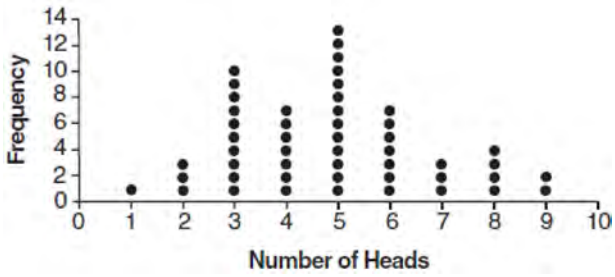
267 The equation $t = \frac{1}{0.0105}\ln\left(\frac{A}{5000}\right)$ relates time, t, in years, to the amount of money, A, earned by a \$5000 investment. Which statement accurately describes the relationship between the average rates of change of t on the intervals [6000, 8000] and [9000, 12,000]?

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].

268 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) $\frac{3}{2} \pm \frac{\sqrt{33}}{2}i$

269 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.

270 Given $c(m) = m^3 - 2m^2 + 4m - 8$, the solution of $c(m) = 0$ is

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

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

272 Evan graphed a cubic function, $f(x) = ax^3 + bx^2 + cx + d$, and determined the roots of $f(x)$ to be ±1 and 2. What is the value of b, if $a = 1$?

1) 1
2) 2
3) –1
4) –2

273 If $p(x) = 2x^3 - 3x + 5$, what is the remainder of $p(x) \div (x - 5)$?

1) –230
2) 0
3) 40
4) 240

274 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) $g(x) = -\frac{1}{2}x - 16$

275 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

276 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

277 If $x - 1$ is a factor of $x^3 - kx^2 + 2x$, what is the value of k?

1) 0
2) 2
3) 3
4) –3

278 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) $1 + \frac{1}{x+2}$

279 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 $S(t) = 50(1 - 0.02)^t$.

280 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) $m_n = 2000(0.84)^{n+1}$

281 Which function's graph has a period of 8 and reaches a maximum height of 1 if at least one full period is graphed?

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) $y = -4\cos(8x) + 5$

282 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

283 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) $\frac{x^2 - 9}{x(x-3)}$

284 Kelly-Ann has $20,000 to invest. She puts half of the money into an account that grows at an annual rate of 0.9% compounded monthly. At the same time, she puts the other half of the money into an account that grows continuously at an annual rate of 0.8%. Which function represents the value of Kelly-Ann's investments after t years?

1) $f(t) = 10,000(1.9)^t + 10,000e^{0.8t}$
2) $f(t) = 10,000(1.009)^t + 10,000e^{0.008t}$
3) $f(t) = 10,000(1.075)^{12t} + 10,000e^{0.8t}$
4) $f(t) = 10,000(1.00075)^{12t} + 10,000e^{0.008t}$

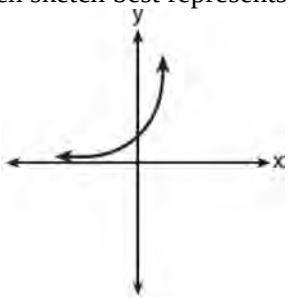
285 What is the inverse of $f(x) = -6(x-2)$?

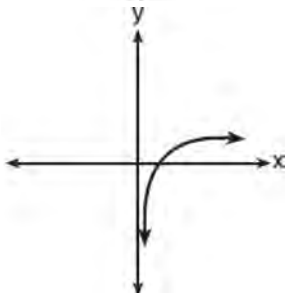
1) $f^{-1}(x) = -2 - \frac{x}{6}$
2) $f^{-1}(x) = 2 - \frac{x}{6}$
3) $f^{-1}(x) = \frac{1}{-6(x-2)}$
4) $f^{-1}(x) = 6(x+2)$

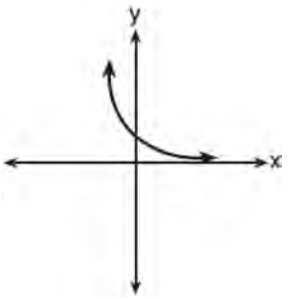
286 The average monthly temperature of a city can be modeled by a cosine graph. Melissa has been living in Phoenix, Arizona, where the average annual temperature is 75°F. She would like to move, and live in a location where the average annual temperature is 62°F. When examining the graphs of the average monthly temperatures for various locations, Melissa should focus on the

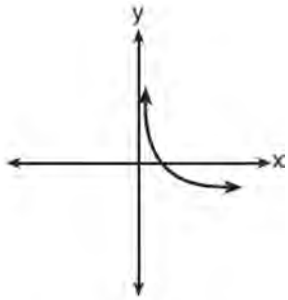
1) amplitude
2) horizontal shift
3) period
4) midline

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

1) 

2) 

3) 

4) 

288 Mrs. Favata's statistics class wants to conduct a survey to see how students feel about changing the school mascot's name. Which plan is the best process for gathering an appropriate sample?

1) Survey students in a random sample of senior homerooms.
2) Survey every tenth student entering art classes in the school.
3) Survey every fourth student entering the cafeteria during each lunch period.
4) Survey all members of the school's varsity sports teams.

289 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) $\dfrac{124}{16x+y}$
2) $\dfrac{x+16y}{124}$
3) $\dfrac{124}{x+16y}$
4) $\dfrac{16x+y}{124}$

290 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 $(b, 0)$.

291 For a given time, x, in seconds, an electric current, y, can be represented by $y = 2.5\left(1 - 2.7^{-.10x}\right)$. Which equation is *not* equivalent?

1) $y = 2.5 - 2.5\left(2.7^{-.10x}\right)$
2) $y = 2.5 - 2.5\left(\left(2.7^2\right)^{-.05x}\right)$
3) $y = 2.5 - 2.5\left(\dfrac{1}{2.7^{.10x}}\right)$
4) $y = 2.5 - 2.5\left(2.7^{-2}\right)\left(2.7^{.05x}\right)$

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

293 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) $(n + 3)(n - 3)(n - 6)(n + 2)$

294 For which values of x, rounded to the *nearest hundredth*, will $\left|x^2 - 9\right| - 3 = \log_3 x$?

1) 2.29 and 3.63
2) 2.37 and 3.54
3) 2.84 and 3.17
4) 2.92 and 3.06

295 For $x > 0$, which expression is equivalent to $\frac{\sqrt[3]{x^2} \bullet \sqrt{x^5}}{\sqrt[6]{x}}$?

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

296 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?

1) observational study
2) controlled experiment
3) survey
4) systematic sample

297 What is the solution set for x in the equation below?

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

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

298 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

299 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) $3x + 1 + \frac{1}{3x + 1}$

300 Given $\cos\theta = \frac{7}{25}$, where θ 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) $\frac{24}{7}$

301 Consider the probability statements regarding events A and B below.

$P(A \text{ or } B) = 0.3$;
$P(A \text{ and } B) = 0.2$; and
$P(A|B) = 0.8$

What is $P(B)$?

1) 0.1
2) 0.25
3) 0.375
4) 0.667

302 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) $8x-4i$

303 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?
1) Every hour, the amount of pain reliever remaining is cut in half.
2) In 12 hours, there is no pain reliever remaining in the body.
3) In 24 hours, there is no pain reliever remaining in the body.
4) In 12 hours, 110 mg of pain reliever is remaining.

304 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

305 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) $f^{-1}(x)=x\log a$

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

307 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) $\frac{(x+7)(x^2+4x+3)}{(x+3)}$

308 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) $y=166.67(1.0032737)^t$

309 How many solutions exist for $\frac{1}{1-x^2}=-|3x-2|+5$?
1) 1
2) 2
3) 3
4) 4

310 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?

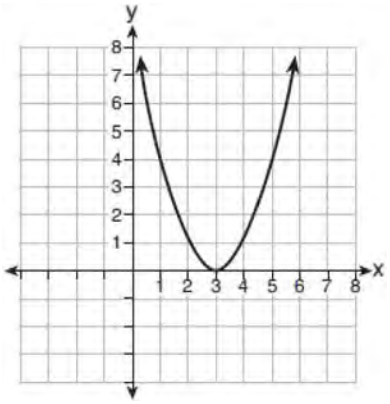
1) $5177.80
2) $5941.30
3) $6146.30
4) $6166.50

311 Which representation of a quadratic has imaginary roots?

1)

x	y
–2.5	2
–2.0	0
–1.5	–1
–1.0	–1
–0.5	0
0.0	2

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

3) 

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

312 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) $f(x) \bullet g(x)$
4) $f(x) \div g(x)$

313 The function below models the average price of gas in a small town since January 1st.

$G(t) = -0.0049t^4 + 0.0923t^3 - 0.56t^2 + 1.166t + 3.23$, where $0 \le t \le 10$.

If $G(t)$ is the average price of gas in dollars and t represents the number of months since January 1st, the absolute maximum $G(t)$ reaches over the given domain is about

1) $1.60
2) $3.92
3) $4.01
4) $7.73

314 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

315 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%

316 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

317 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

318 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) $c(x) = -0.8x^2 + 400x - 300$

319 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

320 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

321 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

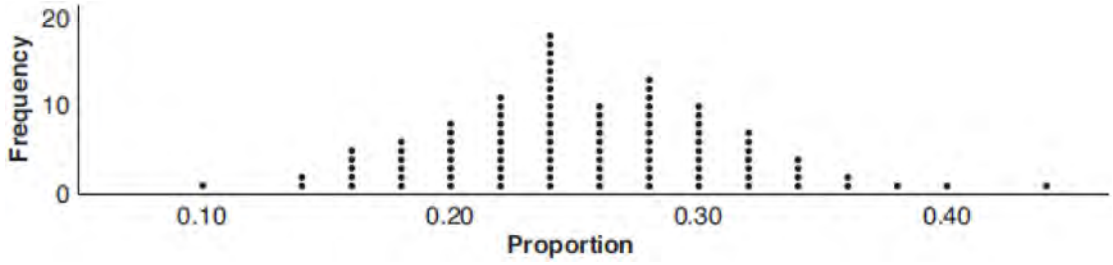
322 Which situation could be modeled using a geometric sequence?

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°. You lower the temperature of your air conditioning by 2° 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.

323 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) $-19 + 27i$

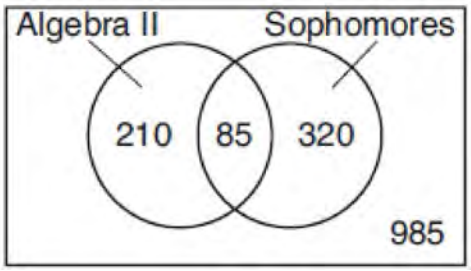
324 A group of students was trying to determine the proportion of candies in a bag that are blue. The company claims that 24% of candies in bags are blue. A simulation was run 100 times with a sample size of 50, based on the premise that 24% of the candies are blue. The approximately normal results of the simulation are shown in the dot plot below.



The simulation results in a mean of 0.254 and a standard deviation of 0.060. Based on this simulation, what is a plausible interval containing the middle 95% of the data?

1) $(0.194, 0.314)$
2) $(0.134, 0.374)$
3) $(-0.448, 0.568)$
4) $(0.254, 0.374)$

325 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) $\frac{85}{1600}$

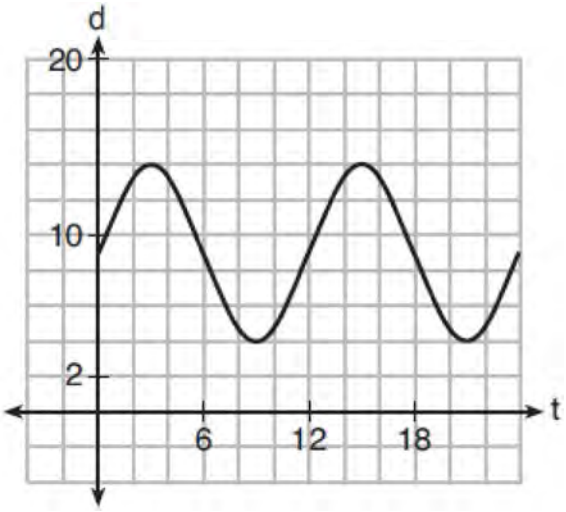
326 The average depreciation rate of a new boat is approximately 8% per year. If a new boat is purchased at a price of \$75,000, which model is a recursive formula representing the value of the boat n years after it was purchased?

1) $a_n = 75,000(0.08)^n$
2) $a_0 = 75,000$
   $a_n = (0.92)^n$
3) $a_n = 75,000(1.08)^n$
4) $a_0 = 75,000$
   $a_n = 0.92(a_{n-1})$

327 Which expression is equivalent to $x^6y^4(x^4 - 16) - 9(x^4 - 16)$?

1) $x^{10}y^4 - 16x^6y^4 - 9x^4 - 144$
2) $(x^6y^4 - 9)(x + 2)^3(x - 2)$
3) $(x^3y^2 + 3)(x^3y^2 - 3)(x + 2)^2(x - 2)^2$
4) $(x^3y^2 + 3)(x^3y^2 - 3)(x^2 + 4)(x^2 - 4)$

328 The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.



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) $d = 5\sin\left(\frac{\pi}{6}t\right) + 9$

329 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) $\{(0,6),(5,21)\}$

330 Which description could represent the graph of $f(x) = 4x^2(x+a) - x - a$, if a is an integer?

1) As $x \to -\infty$, $f(x) \to \infty$, as $x \to \infty$, $f(x) \to \infty$, and the graph has 3 x-intercepts.
2) As $x \to -\infty$, $f(x) \to -\infty$, as $x \to \infty$, $f(x) \to \infty$, and the graph has 3 x-intercepts.
3) As $x \to -\infty$, $f(x) \to \infty$, as $x \to \infty$, $f(x) \to -\infty$, and the graph has 4 x-intercepts.
4) As $x \to -\infty$, $f(x) \to -\infty$, as $x \to \infty$, $f(x) \to \infty$, and the graph has 4 x-intercepts.

331 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) $\sqrt{a^3}$

332 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) $(3,0)$

333 At her job, Pat earns \$25,000 the first year and receives a raise of \$1000 each year. The explicit formula for the nth 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) $a_1 = 25{,}000,\ a_n = a_{n+1} + 1000$

334 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?

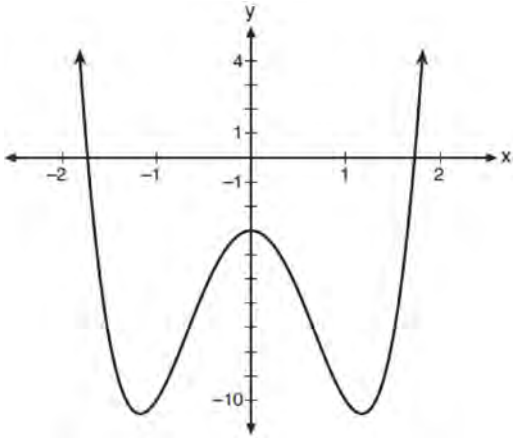
1) $29,400\left(1.068^{\frac{1}{365}}\right)^t$

2) $29,400\left(\frac{1.068}{365}\right)^{365t}$

3) $29,400\left(1+\frac{0.068}{365}\right)^t$

4) $29,400\left(1.068^{\frac{1}{365}}\right)^{365t}$

335 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.

336 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

337 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) $2x^3 - 4x^2 - x$

338 For positive values of x, which expression is equivalent to $\sqrt{16x^2} \bullet x^{\frac{2}{3}} + \sqrt[3]{8x^5}$

1) $6\sqrt[5]{x^3}$
2) $6\sqrt[3]{x^5}$
3) $4\sqrt[3]{x^2} + 2\sqrt[3]{x^5}$
4) $4\sqrt{x^3} + 2\sqrt[5]{x^3}$

339 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

340 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

341 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

342 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) $(-2,-1)$

343 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, $x = 0$.

344 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

345 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) $C = 550(1.00643)^{t+12}$

346 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) $\frac{-c+d}{d+2c}$

347 The terminal side of θ, 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 θ?
1) –3
2) $-\frac{3\sqrt{8}}{8}$
3) $-\frac{1}{3}$
4) $-\frac{\sqrt{8}}{3}$

348 Which function is even?
1) $f(x) = \sin x$
2) $f(x) = x^2 - 4$
3) $f(x) = |x - 2| + 5$
4) $f(x) = x^4 + 3x^3 + 4$

349 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) $-\frac{1}{3} \pm \frac{\sqrt{11}}{3}$

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

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

351 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

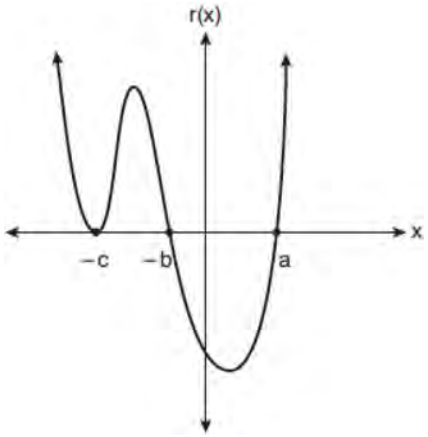
352 Given $P(x) = x^3 - 3x^2 - 2x + 4$, which statement is true?

1) $(x - 1)$ is a factor because $P(-1) = 2$.
2) $(x + 1)$ is a factor because $P(-1) = 2$.
3) $(x + 1)$ is a factor because $P(1) = 0$.
4) $(x - 1)$ is a factor because $P(1) = 0$.

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

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

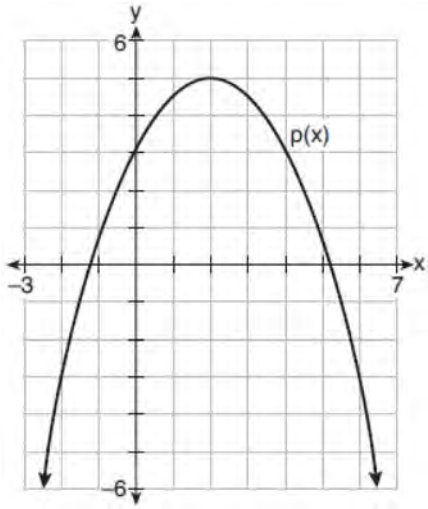
354 A sketch of $r(x)$ is shown below.



An equation for $r(x)$ could be

1) $r(x) = (x - a)(x + b)(x + c)$
2) $r(x) = (x + a)(x - b)(x - c)^2$
3) $r(x) = (x + a)(x - b)(x - c)$
4) $r(x) = (x - a)(x + b)(x + c)^2$

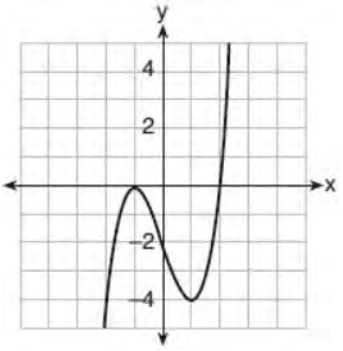
355 Consider $f(x) = 4x^2 + 6x - 3$, and $p(x)$ defined by the graph below.

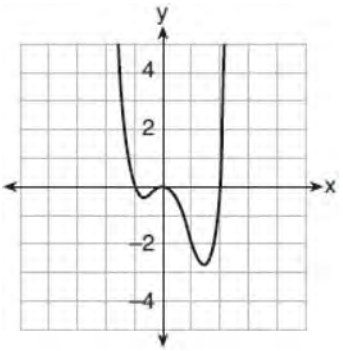


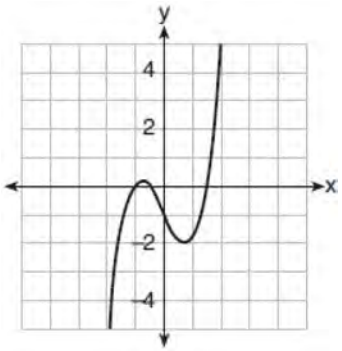
The difference between the values of the maximum of *p* and minimum of *f* is

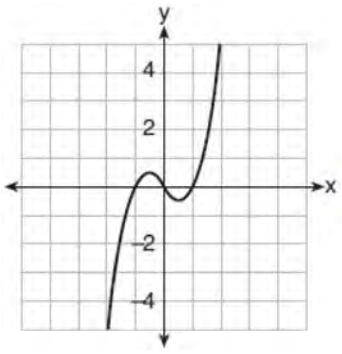
1) 0.25
2) 1.25
3) 3.25
4) 10.25

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

1) 

2) 

3) 

4) 

357 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?

1) \$11,622,614.67
2) \$17,433,922.00
3) \$116,226,146.80
4) \$1,743,392,200.00

358 The value(s) of x that satisfy $\sqrt{x^2 - 4x - 5} = 2x - 10$ are

1) $\{5\}$
2) $\{7\}$
3) $\{5, 7\}$
4) $\{3, 5, 7\}$

359 The expression $6 - (3x - 2i)^2$ is equivalent to

1) $-9x^2 + 12xi + 10$
2) $9x^2 - 12xi + 2$
3) $-9x^2 + 10$
4) $-9x^2 + 12xi - 4i + 6$

360 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

361 Where i is the imaginary unit, the expression $(x + 3i)^2 - (2x - 3i)^2$ is equivalent to

1) $-3x^2$
2) $-3x^2 - 18$
3) $-3x^2 + 18xi$
4) $-3x^2 - 6xi - 18$

362 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°F is poured into a container. The room temperature is kept at a constant 68°F and $k = 0.05$. Coffee is safe to drink when its temperature is, at most, 120°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

363 When a ball bounces, the heights of consecutive bounces form a geometric sequence. The height of the first bounce is 121 centimeters and the height of the third bounce is 64 centimeters. To the *nearest centimeter*, what is the height of the fifth bounce?

1) 25
2) 34
3) 36
4) 42

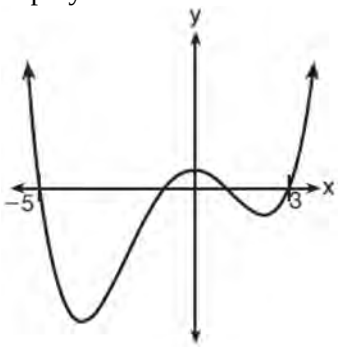
364 The function $N(t) = 100e^{-0.023t}$ models the number of grams in a sample of cesium-137 that remain after t years. On which interval is the sample's average rate of decay the fastest?

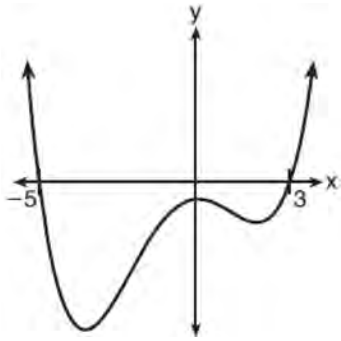
1) [1, 10]
2) [10, 20]
3) [15, 25]
4) [1, 30]

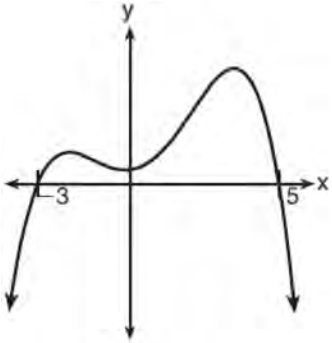
365 The weights of bags of Graseck's Chocolate Candies are normally distributed with a mean of 4.3 ounces and a standard deviation of 0.05 ounces. What is the probability that a bag of these chocolate candies weighs less than 4.27 ounces?

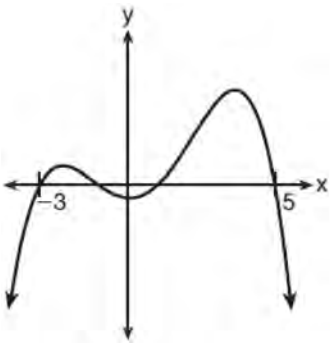
1) 0.2257
2) 0.2743
3) 0.7257
4) 0.7757

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

1) 

2) 

3) 

4) 

367 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

368 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 $0 \le t \le 6$

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

369 What are the solution(s) to the system of equations shown below?

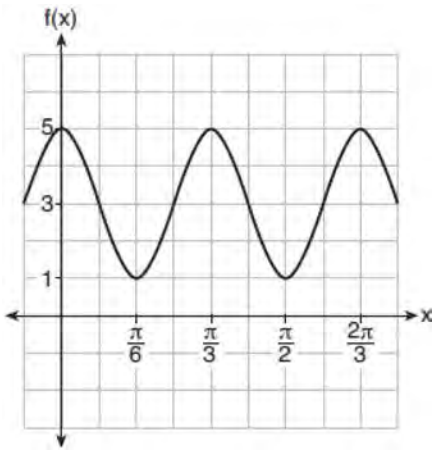
$$x^2 + y^2 = 5$$
$$y = 2x$$

1) $x = 1$ and $x = -1$
2) $x = 1$
3) $(1,2)$ and $(-1,-2)$
4) $(1,2)$, only

370 Given $y > 0$, the expression $\sqrt{3x^2y} \bullet \sqrt[3]{27x^3y^2}$ is equivalent to
1) $81x^5y^3$
2) $3^{1.5}x^2y$
3) $3^{\frac{5}{2}}x^2y^{\frac{5}{3}}$
4) $3^{\frac{3}{2}}x^2y^{\frac{7}{6}}$

371 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) $f(x+1)+3$

372 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) $a = 4, b = \frac{\pi}{3}, c = 3$

373 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) $5x^2 + x - 3$

374 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) $\pm i$

375 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) $\frac{2-2(2.5^{n})}{1-2.5}$

2) $\frac{2-2(2.5^{n-1})}{1-2.5}$

3) $\frac{1-2.5^{n}}{1-2.5}$

4) $\frac{1-2.5^{n-1}}{1-2.5}$

376 If $\cos\theta = -\frac{3}{4}$ and θ 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) $\frac{5}{4}$

377 What is the inverse of $f(x) = \frac{x}{x+2}$, where $x \neq -2$?

1) $f^{-1}(x) = \frac{2x}{x-1}$

2) $f^{-1}(x) = \frac{-2x}{x-1}$

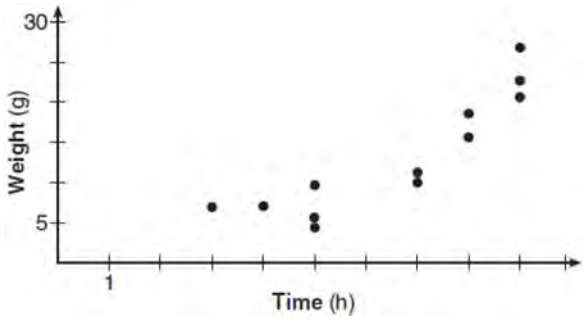
3) $f^{-1}(x) = \frac{x}{x-2}$

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

378 Suppose two sets of test scores have the same mean, but different standard deviations, σ_1 and σ_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.

379 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) $w = 8(.75)^{t}$

380 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%

381 If $\left(a^{3}+27\right) = (a+3)\left(a^{2}+ma+9\right)$, then *m* equals

1) –9
2) –3
3) 3
4) 6

382 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

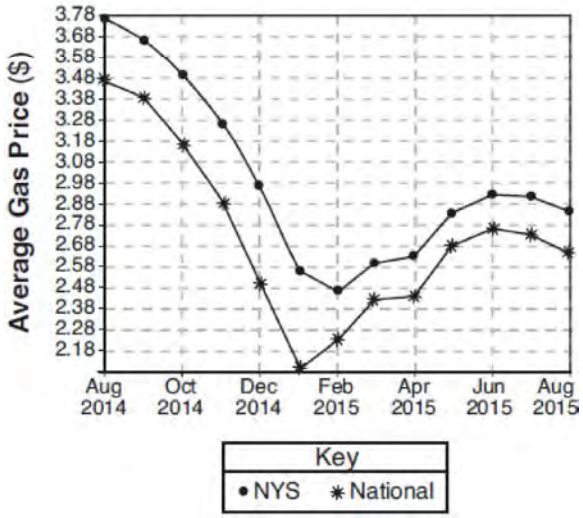
A solution to the equation $f(x) = g(x)$ is

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

383 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) $\{\ \}$

384 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) $G(x) - C$

385 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

386 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) $g(x) = \log_3 x - 5$

387 A 7-year lease for office space states that the annual rent is $85,000 for the first year and will increase by 6% each additional year of the lease. What will the total rent expense be for the entire 7-year lease?

1) $42,809.63
2) $90,425.53
3) $595,000.00
4) $713,476.20

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

389 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

390 When the expression $(x+2)^2 + 4(x+2) + 3$ is rewritten as the product of two binomials, the result is

1) $(x+3)(x+1)$
2) $(x+5)(x+3)$
3) $(x+2)(x+2)$
4) $(x+6)(x+1)$

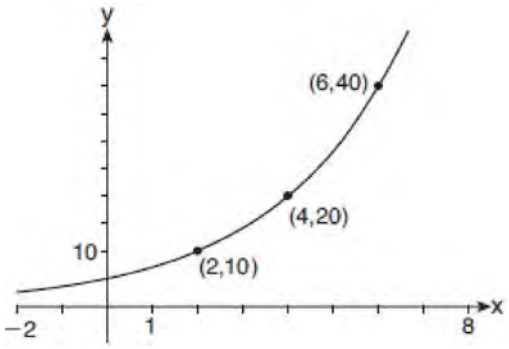
391 A study of black bears in the Adirondacks reveals that their population can be represented by the function $P(t) = 3500(1.025)^t$, where t is the number of years since the study began. Which function is correctly rewritten to reveal the monthly growth rate of the black bear population?

1) $P(t) = 3500(1.00206)^{12t}$
2) $P(t) = 3500(1.00206)^{\frac{t}{12}}$
3) $P(t) = 3500(1.34489)^{12t}$
4) $P(t) = 3500(1.34489)^{\frac{t}{12}}$

392 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) $\frac{1}{5} \pm \frac{\sqrt{66}}{5}$

393 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) $5(2^{2x})$

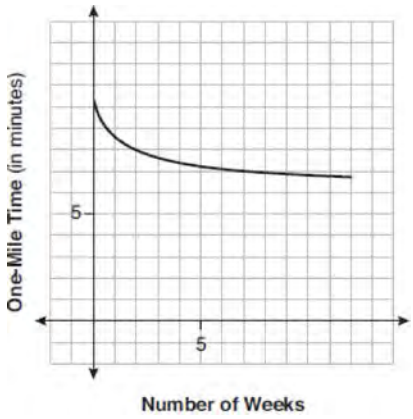
394 Sodium iodide-131, used to treat certain medical conditions, has a half-life of 1.8 hours. The data table below shows the amount of sodium iodide-131, rounded to the nearest thousandth, as the dose fades over time.

Number of Half Lives	1	2	3	4	5
Amount of Sodium Iodide-131	139.000	69.500	34.750	17.375	8.688

What approximate amount of sodium iodide-131 will remain in the body after 18 hours?

1) 0.001
2) 0.136
3) 0.271
4) 0.543

395 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.

396 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) $y = \frac{1}{4x + 5}$

397 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%

398 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?

1) $a_1 = 120$

   $a_n = a_{n-1} + 30$
2) $a_n = 90 + 30n$
3) $a_1 = 2$

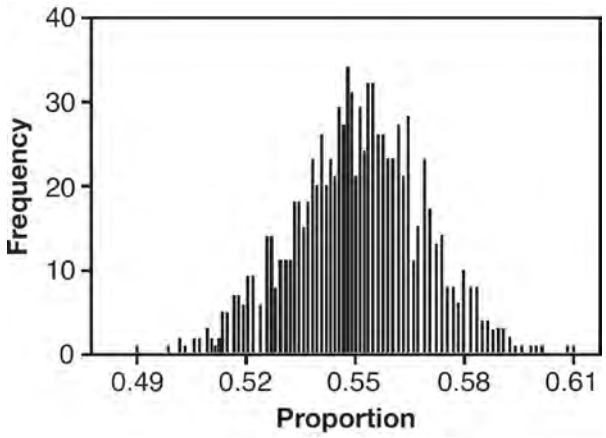
   $a_n = a_{n-1} + 0.5$
4) $a_n = 2.5 + 0.5n$

Algebra II Multiple Choice Regents Exam Questions

399 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) $2d(d - 3)^2(d + 3)$

400 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

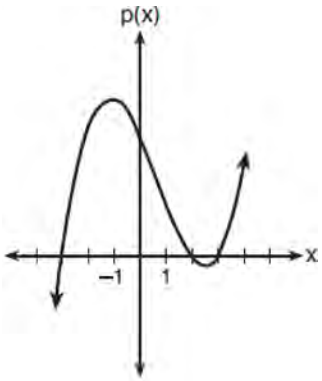
401 A sine function increasing through the origin can be used to model light waves. Violet light has a wavelength of 400 nanometers. Over which interval is the height of the wave *decreasing*, only?

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

402 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) $\frac{8 - 8(0.10)^n}{1.10}$

403 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) $p(x) = x^3 + 2x^2 - 9x - 18$

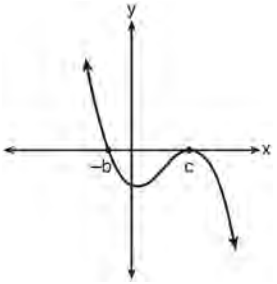
404 If $\sin^2(32°) + \cos^2(M) = 1$, then M equals

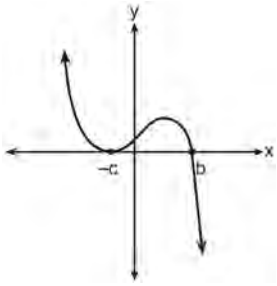
1) 32°
2) 58°
3) 68°
4) 72°

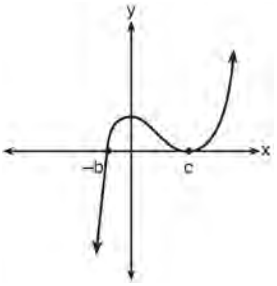
405 What is the solution to $8(2^{x+3}) = 48$?

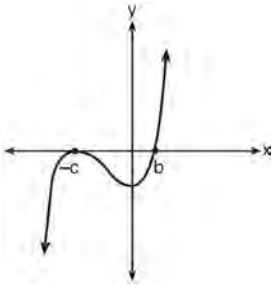
1) $x = \frac{\ln 6}{\ln 2} - 3$
2) $x = 0$
3) $x = \frac{\ln 48}{\ln 16} - 3$
4) $x = \ln 4 - 3$

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

1) 

2) 

3) 

4) 

407 Which function represents exponential decay?

1) $y = 2^{0.3t}$
2) $y = 1.2^{3t}$
3) $y = \left(\frac{1}{2}\right)^{-t}$
4) $y = 5^{-t}$

408 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) $P_0 = 19{,}378{,}000$
   $P_t = 1.015P_{t-1}$

409 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) $9k^2 - 12ki + 4$

410 If $g(c) = 1 - c^2$ and $m(c) = c + 1$, then which statement is *not* true?

1) $g(c) \cdot m(c) = 1 + c - c^2 - c^3$
2) $g(c) + m(c) = 2 + c - c^2$
3) $m(c) - g(c) = c + c^2$
4) $\frac{m(c)}{g(c)} = \frac{-1}{1-c}$

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

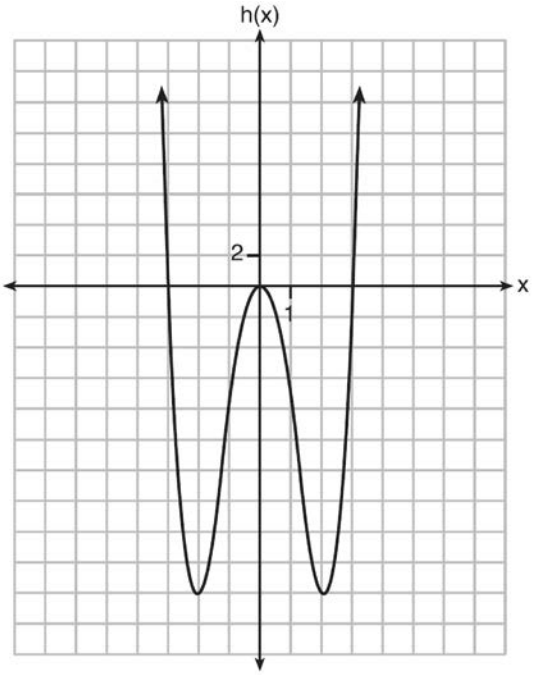
1) $-6 \pm 2i$
2) $-6 \pm 2\sqrt{19}$
3) $6 \pm 2i$
4) $6 \pm 2\sqrt{19}$

412 The inverse of the function $f(x) = \frac{x+1}{x-2}$ is

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

413 Functions *f*, *g*, and *h* are given below.

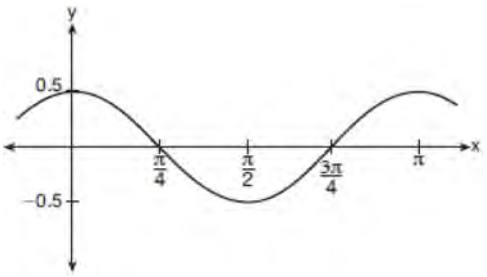
$$f(x) = \sin(2x)$$
$$g(x) = f(x) + 1$$



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

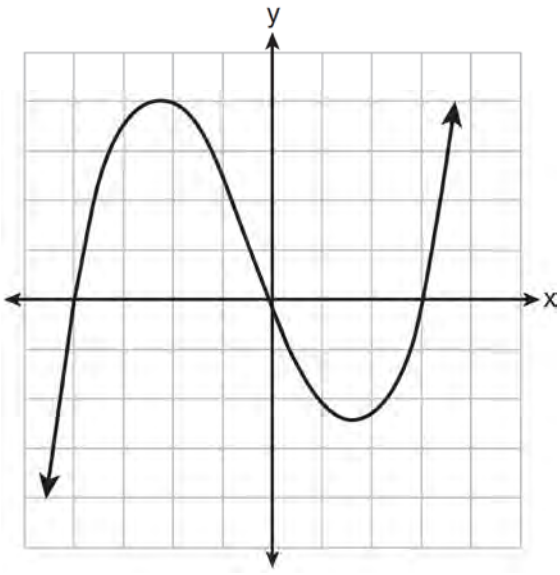
1) $f(x)$ and $g(x)$ are odd, $h(x)$ is even.
2) $f(x)$ and $g(x)$ are even, $h(x)$ is odd.
3) $f(x)$ is odd, $g(x)$ is neither, $h(x)$ is even.
4) $f(x)$ is even, $g(x)$ is neither, $h(x)$ is odd.

414 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) $y = 2\cos\frac{1}{2}x$

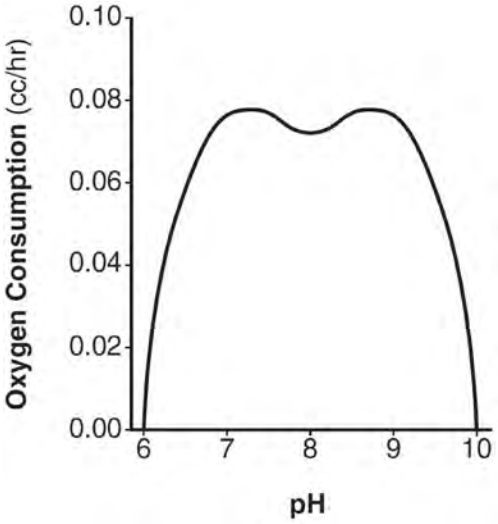
415 The graph of $p(x)$ is shown below.



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

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

416 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.

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

418 The solution set for the equation $\sqrt{x+14} - \sqrt{2x+5} = 1$ is
1) $\{-6\}$
2) $\{2\}$
3) $\{18\}$
4) $\{2, 22\}$

419 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*

420 Which binomial is a factor of $x^4 - 4x^2 - 4x + 8$?
1) $x-2$
2) $x+2$
3) $x-4$
4) $x+4$

421 For $x \neq 0$, which expressions are equivalent to one divided by the sixth root of x?

I. $\dfrac{\sqrt[6]{x}}{\sqrt[3]{x}}$ II. $\dfrac{x^{\frac{1}{6}}}{x^{\frac{1}{3}}}$ III. $x^{\frac{-1}{6}}$

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

422 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) $a_n = 2 \cdot 3^{n+1}$

423 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) $P(A) = 0.15$, $P(B) = 0.05$

424 The loudness of sound is measured in units called decibels (dB). These units are measured by first assigning an intensity I_0 to a very soft sound that is called the threshold sound. The sound to be measured is assigned an intensity, *I*, and the decibel rating, *d*, of this sound is found using $d = 10\log\frac{I}{I_0}$. The threshold sound audible to the average person is 1.0×10^{-12} W/m^2 (watts per square meter). Consider the following sound level classifications:

Moderate	45-69 dB
Loud	70-89 dB
Very loud	90-109 dB
Deafening	>110 dB

How would a sound with intensity 6.3×10^{-3} W/m^2 be classified?

1) moderate
2) loud
3) very loud
4) deafening

425 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) $300e^{-0.42}$

426 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

427 The equation $4x^2 - 24x + 4y^2 + 72y = 76$ is equivalent to

1) $4(x-3)^2 + 4(y+9)^2 = 76$
2) $4(x-3)^2 + 4(y+9)^2 = 121$
3) $4(x-3)^2 + 4(y+9)^2 = 166$
4) $4(x-3)^2 + 4(y+9)^2 = 436$

428 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) $2x^2 - x + 4 + \frac{1}{2x-1}$

429 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)

430 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

431 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

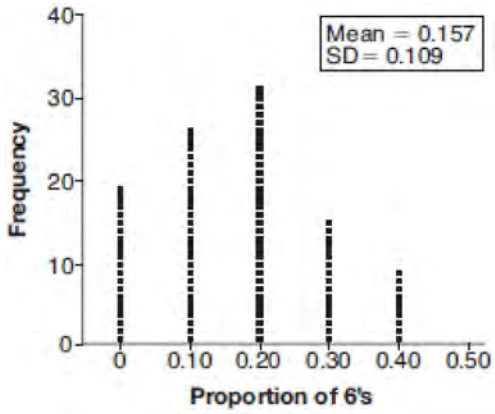
432 Based on climate data that have been collected in Bar Harbor, Maine, the average monthly temperature, in degrees F, can be modeled by the equation $B(x) = 23.914\sin(0.508x - 2.116) + 55.300$. The same governmental agency collected average monthly temperature data for Phoenix, Arizona, and found the temperatures could be modeled by the equation $P(x) = 20.238\sin(0.525x - 2.148) + 86.729$. Which statement can *not* be concluded based on the average monthly temperature models x months after starting data collection?
1) The average monthly temperature variation is more in Bar Harbor than in Phoenix.
2) The midline average monthly temperature for Bar Harbor is lower than the midline temperature for Phoenix.
3) The maximum average monthly temperature for Bar Harbor is 79° F, to the nearest degree.
4) The minimum average monthly temperature for Phoenix is 20° F, to the nearest degree.

433 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

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

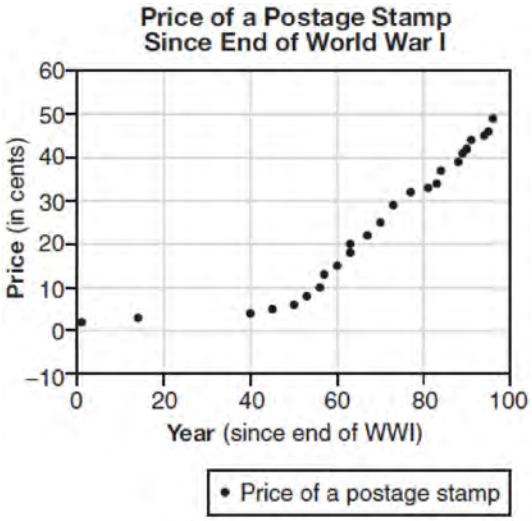
For Miles to win, the spinner must land on the number 6. After spinning the spinner 10 times, and losing all 10 times, Miles complained that the spinner is unfair. At home, his dad ran 100 simulations of spinning the spinner 10 times, assuming the probability of winning each spin is $\frac{1}{6}$.

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.

435 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) $y = 24\sin(14x) + 25$

436 Which expression has been rewritten correctly to form a true statement?

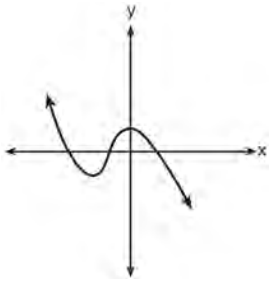
1) $(x+2)^2 + 2(x+2) - 8 = (x+6)x$
2) $x^4 + 4x^2 + 9x^2y^2 - 36y^2 = (x+3y)^2(x-2)^2$
3) $x^3 + 3x^2 - 4xy^2 - 12y^2 = (x-2y)(x+3)^2$
4) $(x^2-4)^2 - 5(x^2-4) - 6 = (x^2-7)(x^2-6)$

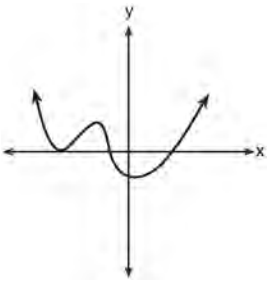
437 If $p(x) = ab^x$ and $r(x) = cd^x$, then $p(x) \bullet r(x)$ equals

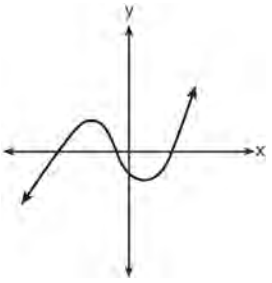
1) $ac(b+d)^x$
2) $ac(b+d)^{2x}$
3) $ac(bd)^x$
4) $ac(bd)^{x^2}$

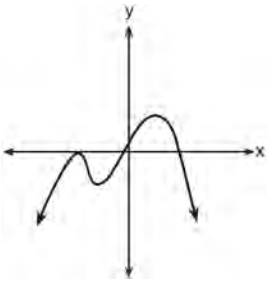
438 Which graph has the following characteristics?

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

1) 

2) 

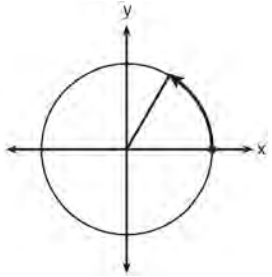
3) 

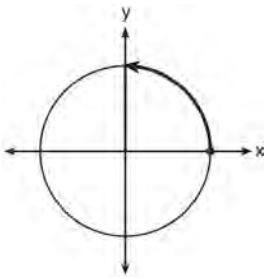
4) 

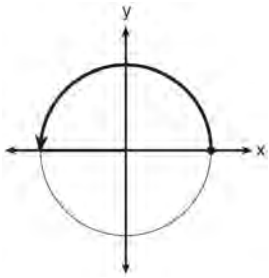
439 A rabbit population doubles every 4 weeks. There are currently five rabbits in a restricted area. If t represents the time, in weeks, and $P(t)$ is the population of rabbits with respect to time, about how many rabbits will there be in 98 days?

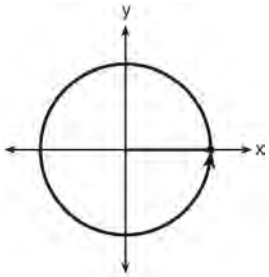
1) 56
2) 152
3) 3688
4) 81,920

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

1) 

2) 

3) 

4) 

441 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) $(1.4, 3.4)$

442 What does $\left(\frac{-54x^9}{y^4}\right)^{\frac{2}{3}}$ equal?

1) $\frac{9ix^6\sqrt[3]{4}}{y\sqrt[3]{y^2}}$
2) $\frac{9ix^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$
3) $\frac{9x^6\sqrt[3]{4}}{y\sqrt[3]{y}}$
4) $\frac{9x^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$

443 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 $y = -4$.

444 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 $-1 - 4i$

445 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

446 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.

m	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

447 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) $t = 11$

448 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

449 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) $t^3 + 5t^2 + 6t + t^2 + 5t + 6 = (t + 1)(t + 2)(t + 3)$

450 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) $C(n) = \dfrac{329.99 + 108.78n}{n}$
4) $C(n) = \dfrac{329.99 + 326.34n}{n}$

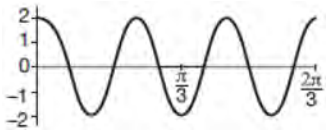
451 To solve $\dfrac{2x}{x-2} - \dfrac{11}{x} = \dfrac{8}{x^2 - 2x}$, Ren multiplied both sides by the least common denominator. Which statement is true?

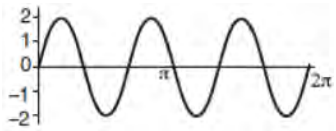
1) 2 is an extraneous solution.
2) $\dfrac{7}{2}$ is an extraneous so1ution.
3) 0 and 2 are extraneous solutions.
4) This equation does not contain any extraneous solutions.

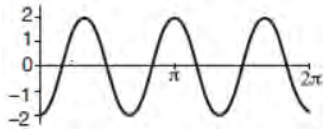
452 The zeros for $f(x) = x^4 - 4x^3 - 9x^2 + 36x$ are
1) $\{0, \pm 3, 4\}$
2) $\{0, 3, 4\}$
3) $\{0, \pm 3, -4\}$
4) $\{0, 3, -4\}$

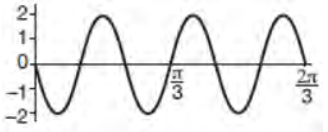
453 A ball is dropped from a height of 32 feet. It bounces and rebounds 80% of the height from which it was falling. What is the total downward distance, in feet, the ball traveled up to the 12th bounce?
1) 29
2) 58
3) 120
4) 149

454 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) $(k+2)(k-2)(k+6)(k+2)$

455 Which graph represents a cosine function with no horizontal shift, an amplitude of 2, and a period of $\frac{2\pi}{3}$?
1) 

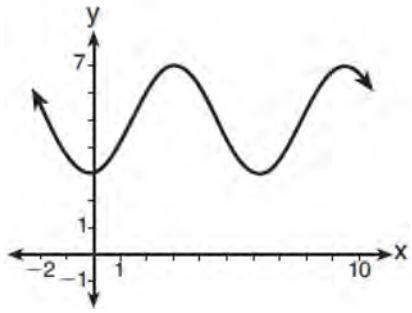
2) 

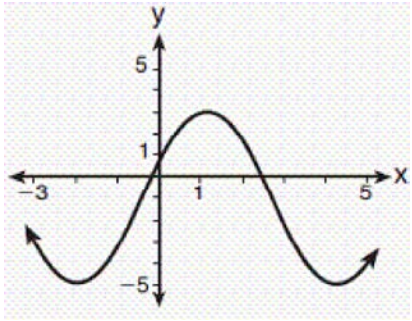
3) 

4) 

456 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

457 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

458 Which sinusoid has the greatest amplitude?
1) 

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

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

459 The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height, H, in feet, above the ground of one of the six-person cars can be modeled by $H(t) = 70\sin\left(\frac{2\pi}{7}(t-1.75)\right) + 80$, where t is time, in minutes. Using $H(t)$ for one full rotation, this car's minimum height, in feet, is
1) 150
2) 70
3) 10
4) 0

460 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 $g(x)$.

461 Which statement about the graph of $c(x) = \log_6 x$ is *false*?
1) The asymptote has equation $y = 0$.
2) The graph has no y-intercept.
3) The domain is the set of positive reals.
4) The range is the set of all real numbers.

462 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

463 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) $y^2 + 4$

464 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) $\frac{1}{2}$

465 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) $3x^2 + 13x + \frac{49}{2} + \frac{151}{2x+3}$

466 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) $(1.00427)^{\frac{m}{12}}$

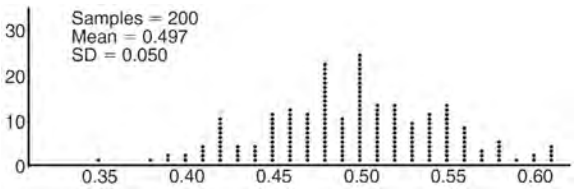
467 A manufacturing company has developed a cost model, $C(x) = 0.15x^3 + 0.01x^2 + 2x + 120$, where x is the number of items sold, in thousands. The sales price can be modeled by $S(x) = 30 - 0.01x$. Therefore, revenue is modeled by $R(x) = x \bullet S(x)$. The company's profit, $P(x) = R(x) - C(x)$, 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) $-0.15x^3 + 32x + 120$

468 A circle centered at the origin has a radius of 10 units. The terminal side of an angle, θ, 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) $\frac{4}{5}$

469 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.

470 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.

471 The Rickerts decided to set up an account for their daughter to pay for her college education. The day their daughter was born, they deposited $1000 in an account that pays 1.8% compounded annually. Beginning with her first birthday, they deposit an additional $750 into the account on each of her birthdays. Which expression correctly represents the amount of money in the account n years after their daughter was born?

1) $a_n = 1000(1.018)^n + 750$
2) $a_n = 1000(1.018)^n + 750n$
3) $a_0 = 1000$

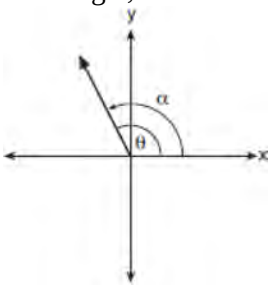
   $a_n = a_{n-1}(1.018) + 750$
4) $a_0 = 1000$

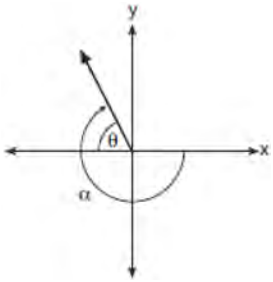
   $a_n = a_{n-1}(1.018) + 750n$

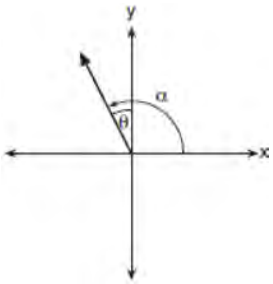
472 To the *nearest tenth*, the value of x that satisfies $2^x = -2x + 11$ is

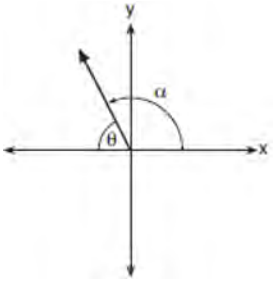
1) 2.5
2) 2.6
3) 5.8
4) 5.9

473 Which diagram represents an angle, α, measuring $\frac{13\pi}{20}$ radians drawn in standard position, and its reference angle, θ?

1) 

2) 

3) 

4) 

474 The function $f(x) = 2^{-0.25x} \bullet \sin\left(\frac{\pi}{2}x\right)$ 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

475 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.

476 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) $300(1.30)^{\frac{365}{14}}$

477 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?

1) $S = 100(1.03)^{12}$
2) $S = \frac{100 - 100(1.0025)^{12}}{1 - 1.0025}$
3) $S = 100(1.0025)^{12}$
4) $S = \frac{100 - 100(1.03)^{12}}{1 - 1.03}$

478 The set of data in the table below shows the results of a survey on the number of messages that people of different ages text on their cell phones each month.

	Text Messages per Month		
Age Group	0-10	11-50	Over 50
15-18	4	37	68
19-22	6	25	87
23-60	25	47	157

If a person from this survey is selected at random, what is the probability that the person texts over 50 messages per month given that the person is between the ages of 23 and 60?

1) $\frac{157}{229}$
2) $\frac{157}{312}$
3) $\frac{157}{384}$
4) $\frac{157}{456}$

479 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

480 As x increases from 0 to $\frac{\pi}{2}$, the graph of the equation $y = 2\tan x$ will

1) increase from 0 to 2
2) decrease from 0 to –2
3) increase without limit
4) decrease without limit

481 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) $\frac{1}{F} - \frac{1}{W}$

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

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

483 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) $B(t) = 750(1.16)^{\frac{t}{12}}$

484 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 $-i$

485 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 ± 115
2) 430 ± 230
3) 496 ± 115
4) 496 ± 230

486 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) $P = 714(0.9750)^y$

487 If the terminal side of angle θ, 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) $-\frac{4}{5}$

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

489 The population of Jamesburg for the years 2010-2013, respectively, was reported as follows:
250,000 250,937 251,878 252,822
How can this sequence be recursively modeled?

1) $j_n = 250,000(1.00375)^{n-1}$
2) $j_n = 250,000 + 937^{(n-1)}$
3) $j_1 = 250,000$
   $j_n = 1.00375j_{n-1}$
4) $j_1 = 250,000$
   $j_n = j_{n-1} + 937$

490 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

491 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.

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

493 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 $x \to -\infty$.
4) $g(x)$, $h(x)$, and $j(x)$ have rational zeros.

494 A recursive formula for the sequence $18, 9, 4.5, \ldots$ is

1) $g_1 = 18$

$$g_n = \frac{1}{2} g_{n-1}$$

2) $g_n = 18\left(\frac{1}{2}\right)^{n-1}$
3) $g_1 = 18$

$$g_n = 2g_{n-1}$$

4) $g_n = 18(2)^{n-1}$

495 Which binomial is *not* a factor of the expression $x^3 - 11x^2 + 16x + 84$?

1) $x + 2$
2) $x + 4$
3) $x - 6$
4) $x - 7$

496 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) $x = 3^y$

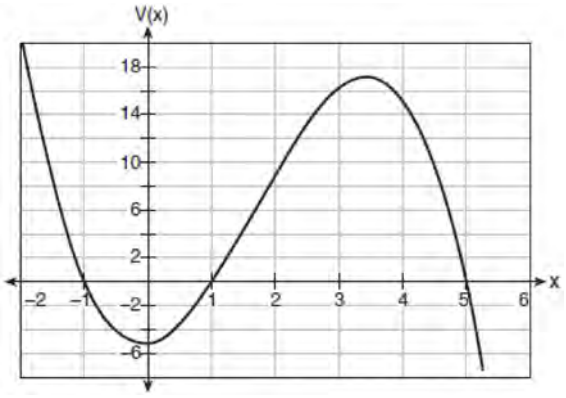
497 The expression $6xi^3(-4xi + 5)$ is equivalent to

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

498 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) $2x^2 + 1 + \frac{4}{x+2}$

499 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]

500 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.

501 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) $400(1.001121184)^{52t}$

502 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) $2x^2-2.5x-5-\frac{20}{2x+3}$

503 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) $m(m^2+3)(m^2-2)$

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 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) $V=120\sin(120\pi t)$

506 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) $x^2 - 2x + 2 = 0$

507 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) $-3x^{-1} + x^{-2}$

508 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.

509 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) $\frac{255 + 90T}{T + 3} = 93$

510 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) $A = 100(0.116381)^t$

511 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

512 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) $-m\sqrt[5]{m}$
4) $\frac{1}{m\sqrt[5]{m}}$

513 Consider the system shown below.

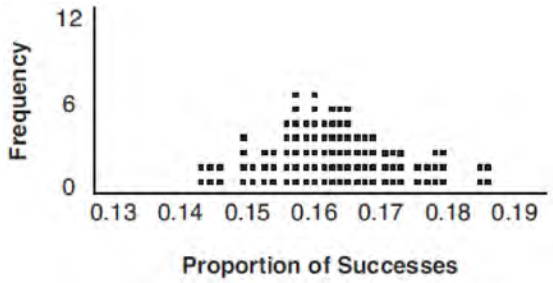
$$2x - y = 4$$

$$(x + 3)^2 + y^2 = 8$$

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

514 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 $\approx .16$

515 Which equation represents an odd function?

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

516 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

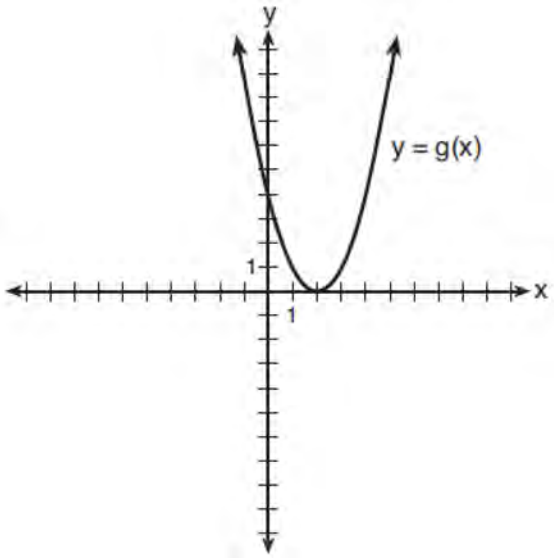
517 The solution set for the equation $\sqrt{56 - x} = x$ is

1) $\{-8, 7\}$
2) $\{-7, 8\}$
3) $\{7\}$
4) $\{\ \}$

518 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

519 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) $\{(1, 1), (6, 16)\}$

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

521 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) $\left(\sqrt[d]{3b}\right)^2$

522 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 2 Point Regents Exam Questions

523 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.

Favorite Type of Program			
	Sports	**Reality Show**	**Comedy Series**
Senior	83	110	67
Freshmen	119	103	54

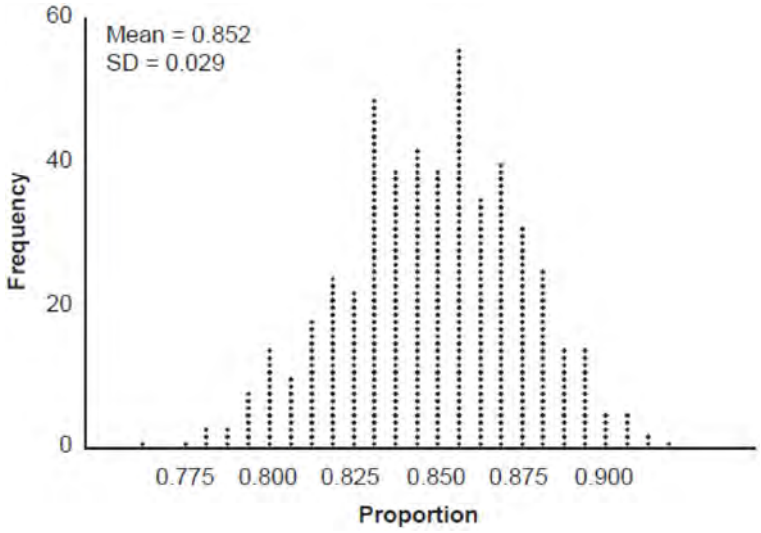
A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.

524 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.

525 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.

526 The results of a survey of the students at the local high school regarding the topic "What I Do to Relax" are displayed in the table below.

	Read	Listen to Music	Exercise
Female	87	94	21
Male	68	110	18

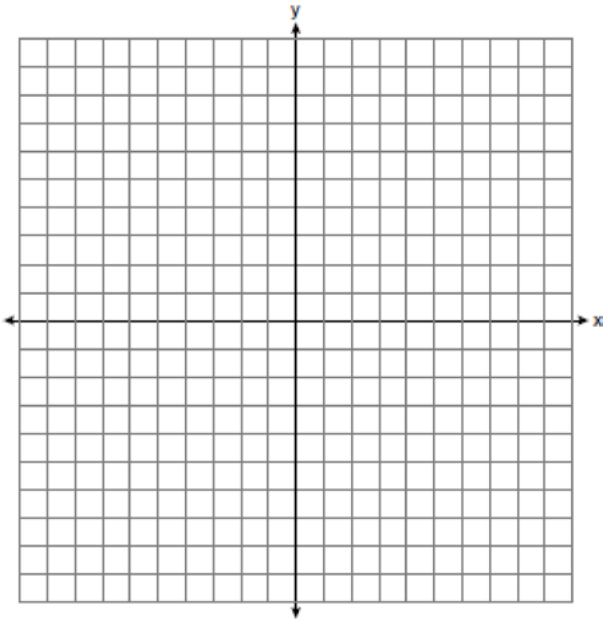
If a student from this survey is selected at random, determine the exact probability that the person claims to relax by listening to music given that the person is female.

527 Consider the data in the table below.

x	1	2	3	4	5	6
y	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*.

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



529 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.*

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

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

532 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

533 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 θ is in Quadrant II.

534 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.

535 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.

536 Over the set of integers, factor the expression $x^4 - 4x^2 - 12$.

537 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.

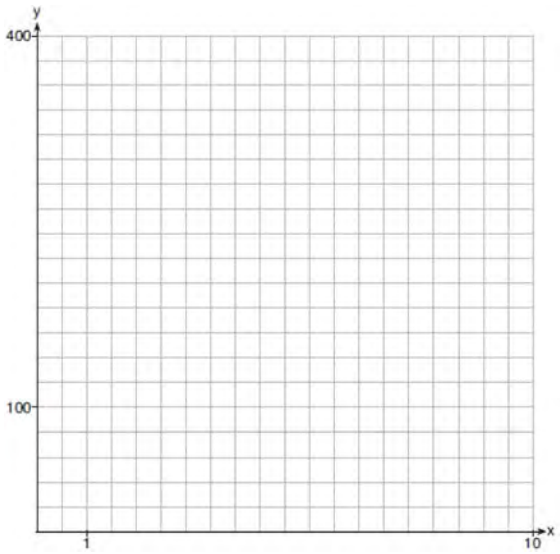
	Wear Glasses	Don't Wear Glasses
Blue Eyes	0.14	0.26
Brown Eyes	0.11	0.24
Green Eyes	0.10	0.15

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

538 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and -2.

539 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.

540 Graph $y = 400(.85)^{2x} - 6$ on the set of axes below.

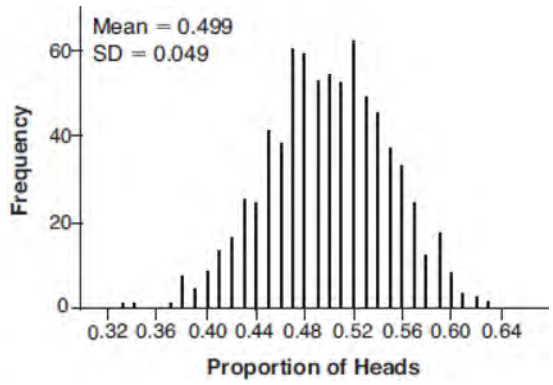


541 Can $f(x) = x^3 + 7$ be classified as an odd function? Justify your answer.

542 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.

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

544 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.

545 Factor $x^3 + 4x^2 - 9x - 36$ completely.

546 Express $8xi^{10} - 4yi^{19} + 2yi^3 - 6xi$ in simplest form, where i is the imaginary unit.

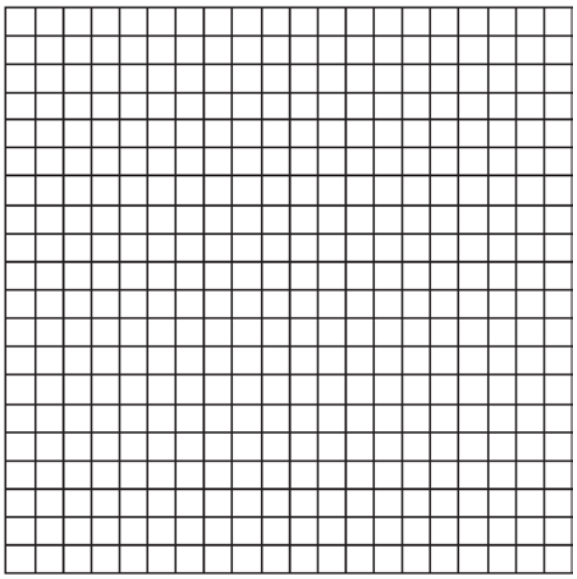
547 Given $a > 0$, solve the equation $a^{x+1} = \sqrt[3]{a^2}$ for x algebraically.

548 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.

549 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.

550 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.

551 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.



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

$$(2 + 4i)(3 - i)$$
$$= 6 - 2i + 12i - 4i^2$$
$$= 6 + 10i - 4i^2$$
$$= 6 + 10i - 4(1)$$
$$= 6 + 10i - 4$$
$$= 2 + 10i$$

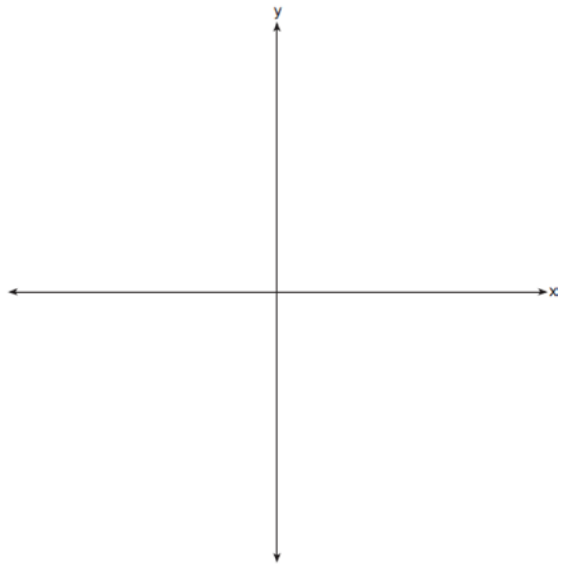
Identify the error in the process shown and determine the correct product of $(2 + 4i)$ and $(3 - i)$.

553 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

554 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 $r(x) = a(x)$.



555 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.

556 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.

557 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

558 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.

559 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.

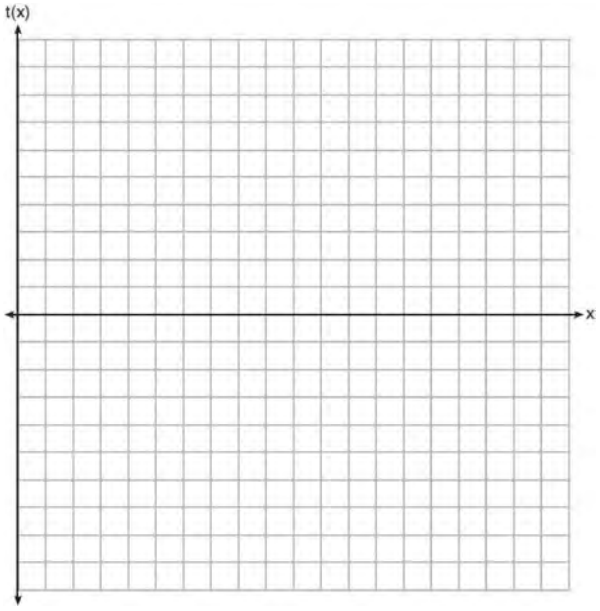
560 A house purchased 5 years ago for \$100,000 was just sold for \$135,000. Assuming exponential growth, approximate the annual growth rate, to the *nearest percent*.

561 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.

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



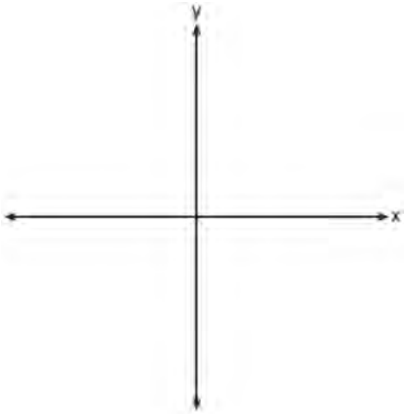
563 Over the set of integers, factor the expression $4x^3 - x^2 + 16x - 4$ completely.

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

565 Given $f(x) = \frac{2}{3}x + 6$, write the equation of $f^{-1}(x)$.

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

567 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.



568 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.

569 Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.

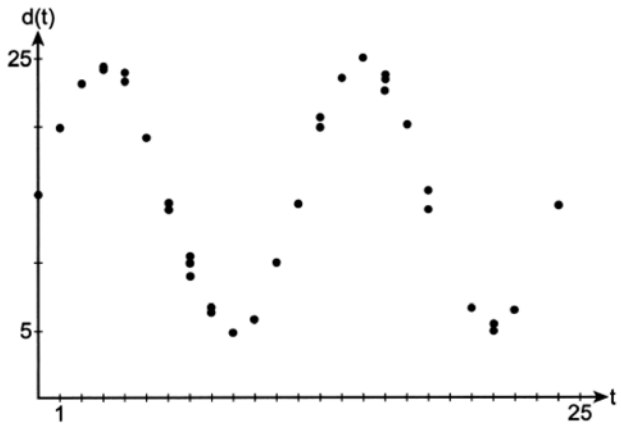
570 Researchers in a local area found that the population of rabbits with an initial population of 20 grew continuously at the rate of 5% per month. The fox population had an initial value of 30 and grew continuously at the rate of 3% per month. Find, to the *nearest tenth of a month*, how long it takes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

571 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.

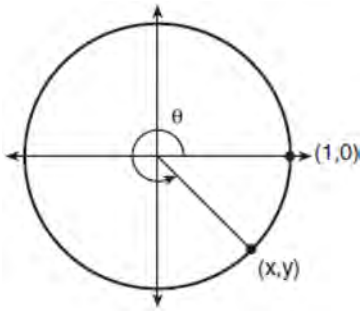
572 Data collected showing the depth of the water in a bay during a 24-hour period are shown in the graph below.



The depth of the water can be modeled with a trigonometric function of the form $d(t) = A\sin\left(\frac{\pi}{6}t\right) + C$. Estimate the value of A, to the *nearest integer*. Justify your answer.

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

574 Using the unit circle below, explain why $\csc\theta = \frac{1}{y}$.



575 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.

576 An angle, θ, is drawn in standard position and terminates in Quadrant III. Given $\cos\theta = -\frac{\sqrt{10}}{10}$, determine the value of $\tan\theta$.

577 Describe the transformation applied to the graph of $p(x) = 2^x$ that forms the new function $q(x) = 2^{x-3} + 4$.

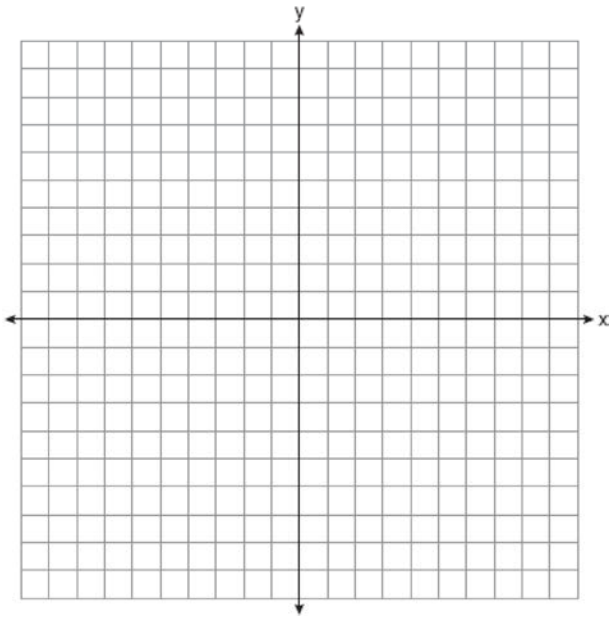
578 The population of bacteria, $P(t)$, in hundreds, after t hours can be modeled by the function $P(t) = 37e^{0.0532t}$. Determine whether the population is increasing or decreasing over time. Explain your reasoning.

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

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

581 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.

582 Graph *at least one* cycle of $y = 5\sin(4x) - 3$ on the set of axes below.



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

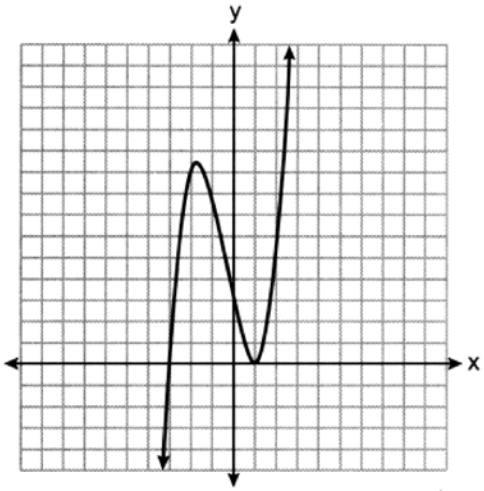
584 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function $p(t) = 2560e^{0.017185t}$, where t is time in years after 1950 and $p(t)$ is the population in millions. Determine the average rate of change of $p(t)$ in millions of people per year,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

585 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.

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

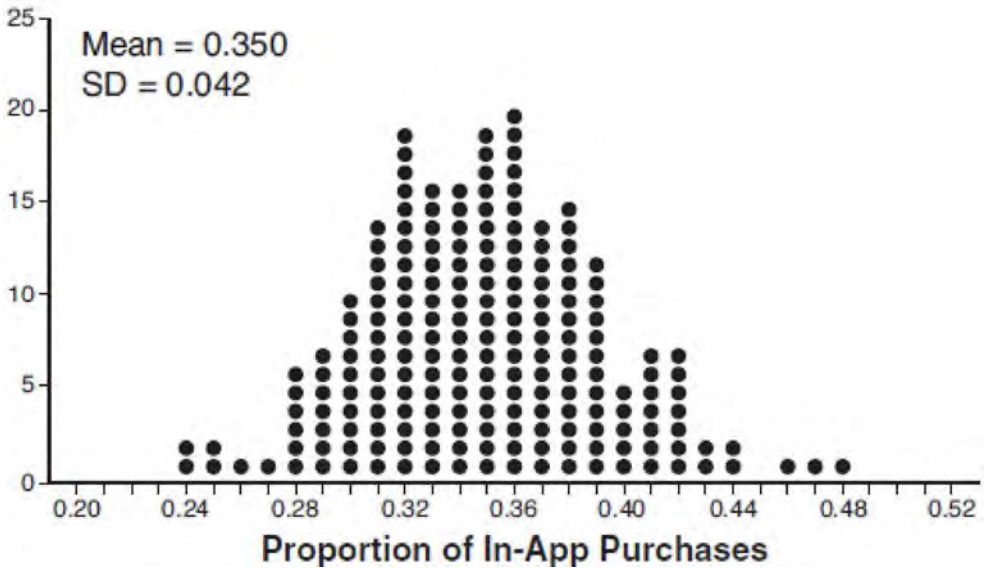
587 Solve algebraically for all values of x: $\sqrt{4x+1} = 11 - x$

588 The graph of $y = f(x)$ is shown below. The cubic function has a leading coefficient of 1.



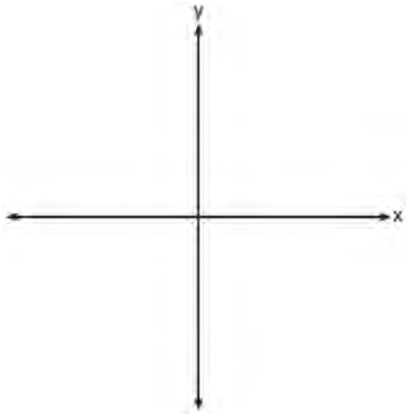
Write an equation for $f(x)$.

589 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.

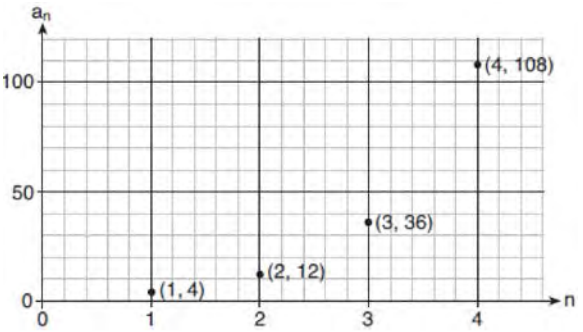
590 On the axes below, sketch a possible function $p(x) = (x-a)(x-b)(x+c)$, where a, b, and c are positive, $a > b$, and $p(x)$ has a positive y-intercept of d. Label all intercepts.



591 Algebraically determine the solution(s) to the equation $2x^2 = 2x - 1$, in simplest $a + bi$ form.

592 The job satisfaction rating at a company is approximately normally distributed with a mean of 12. About 95% of the scores are between 8 and 16. What is the standard deviation of this distribution? Justify your answer.

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



594 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.

595 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.

A	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{6}{9}$	$\frac{8}{9}$	1
D	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.

596 Write a recursive formula for the sequence $8, 20, 50, 125, 312.5, \ldots$

597 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*.

598 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.

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

$$y = x^2 + 8x - 5$$
$$y = 8x - 4$$

600 Write a recursive formula for the sequence $189, 63, 21, 7, \ldots$.

601 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*.

602 Solve algebraically for x: $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

603 Show why $x - 3$ is a factor of $m(x) = x^3 - x^2 - 5x - 3$. Justify your answer.

604 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.

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

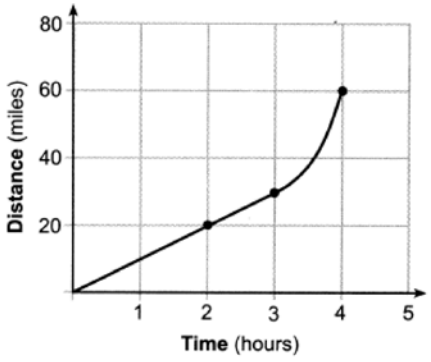
606 Determine if $x + 4$ is a factor of $2x^3 + 10x^2 + 4x - 16$. Explain your answer.

607 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?

608 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.

609 Explain how $\left(3^{\frac{1}{5}}\right)^2$ can be written as the equivalent radical expression $\sqrt[5]{9}$.

610 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



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

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

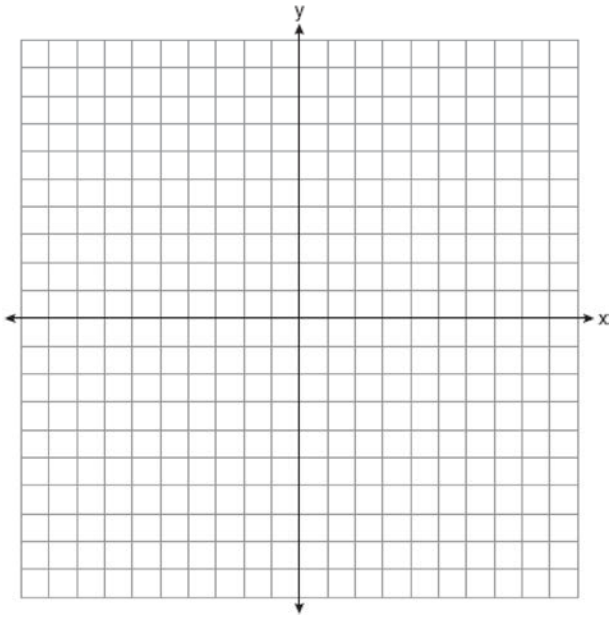
612 Rewrite the expression $\left(4x^2+5x\right)^2 - 5\left(4x^2+5x\right) - 6$ as a product of four linear factors.

613 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.

614 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?

615 Graph $y = x^3 - 4x^2 + 2x + 7$ on the set of axes below.



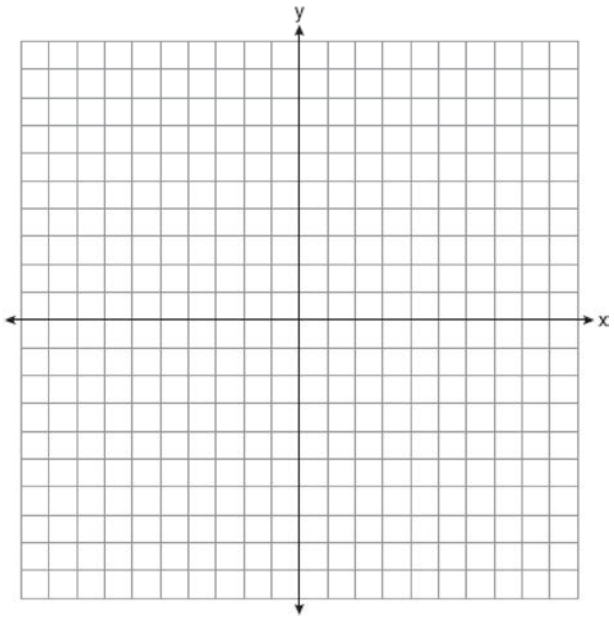
616 A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

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*.

617 Given the geometric series $300 + 360 + 432 + 518.4 + \ldots$, 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.*

618 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 $(0, 2)$.



619 Given $a > 1$, use the properties of rational exponents to determine the value of x for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{\left(a^3\right)^{\frac{1}{2}}} = a^x$$

620 Algebraically determine the zeros of the function below.

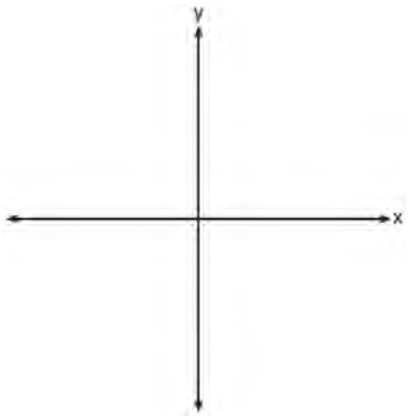
$$r(x) = 3x^3 + 12x^2 - 3x - 12$$

621 Solve algebraically for n: $\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$

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

623 Sketch a graph of polynomial $P(x)$, given the criteria below:

- $P(x)$ has zeros only at $-5, 1$, and 4
- As $x \to \infty, P(x) \to -\infty$
- As $x \to -\infty, P(x) \to -\infty$



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

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

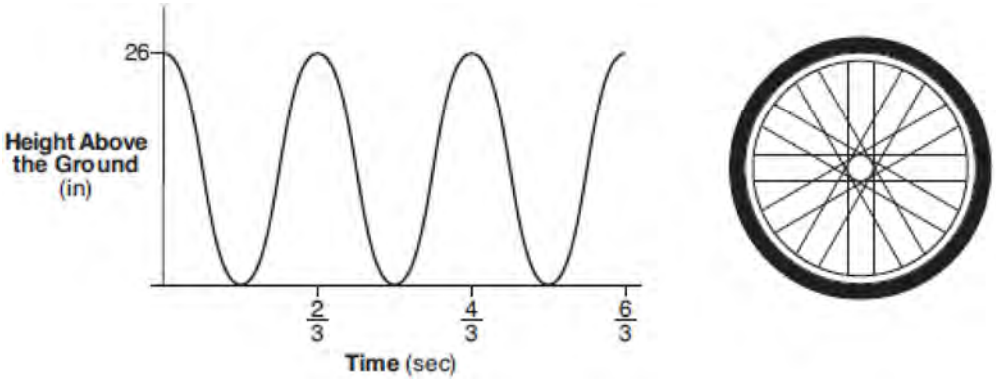
$$Q(x) = x^3 - 3x^2 - 16x - 12$$

625 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.

626 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.

627 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.

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

629 Solve algebraically for all values of x:
$\sqrt{x-5} + x = 7$

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

631 Solve the following system of equations algebraically. $x^2 + y^2 = 400$

$y = x - 28$

632 The polynomial function $g(x) = x^3 + ax^2 - 5x + 6$ has a factor of $(x - 3)$. Determine the value of a.

633 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.

634 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 $q(x) + \frac{r(x)}{g(x)}$.

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

636 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.

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

638 Given $\tan\theta = \frac{7}{24}$, and θ terminates in Quadrant III, determine the value of $\cos\theta$.

639 Solve algebraically for all values of x: $\frac{8}{x+5} - \frac{3}{x} = 5$

640 Point $M\left(t, \frac{4}{7}\right)$ is located in the second quadrant on the unit circle. Determine the exact value of t.

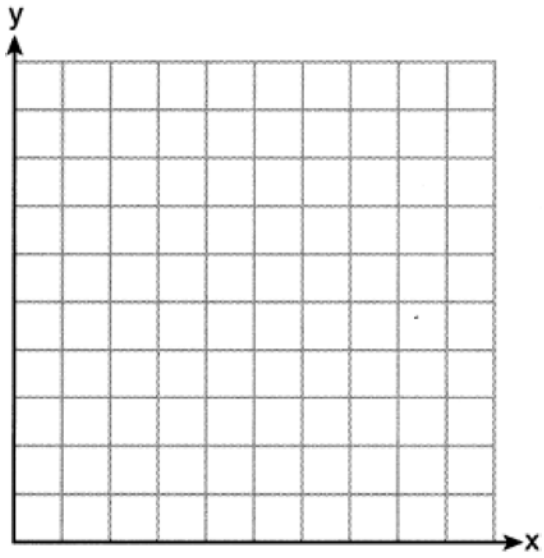
641 Biologists are studying a new bacterium. They create a culture with 100 of the bacteria and anticipate that the number of bacteria will double every 30 hours. Write an equation for the number of bacteria, *B*, in terms of the number of hours, *t*, since the experiment began.

642 Write $(5 + 2yi)(4 - 3i) - (5 - 2yi)(4 - 3i)$ in $a + bi$ form, where y is a real number.

643 Is $x + 3$ a factor of $7x^3 + 27x^2 + 9x - 27$? Justify your answer.

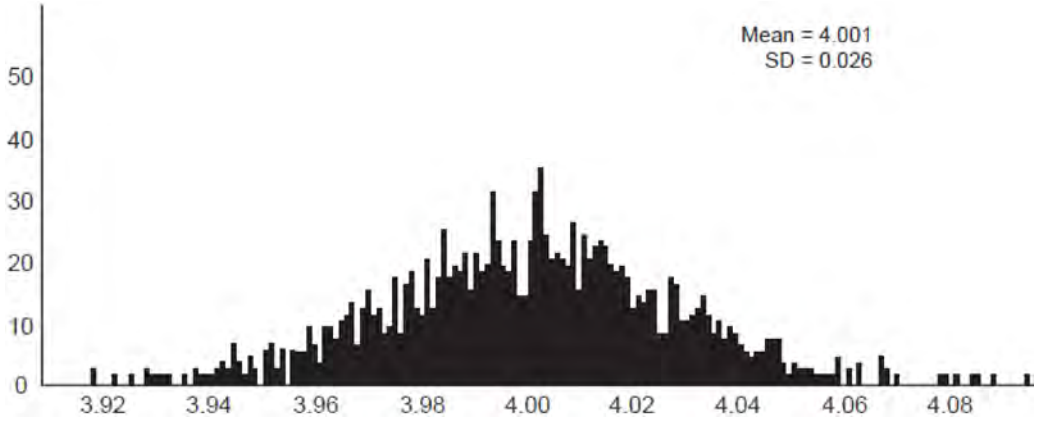
644 Over the set of integers, factor the expression $2x^4 - 10x^3 + 3x^2 - 15x$ completely.

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



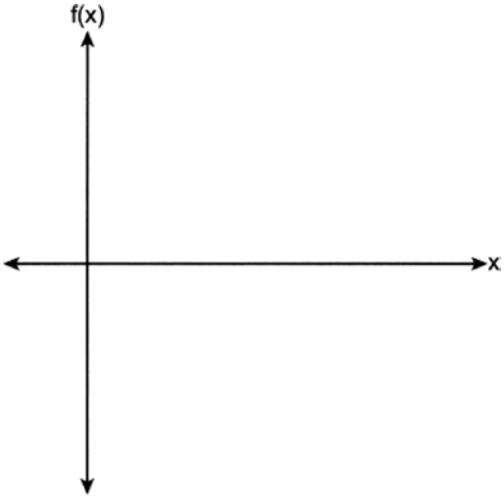
646 When the function $p(x)$ is divided by $x - 1$ the quotient is $x^2 + 7 + \frac{5}{x-1}$. State $p(x)$ in standard form.

647 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 of4 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.

648 On the coordinate plane below, sketch *at least one cycle* of the function $f(x) = 4\cos(2x)$. Label the axes with an appropriate scale.



649 Given x is a real number, write the expression in simplest $a + bi$ form: $(x + 2i)(3 - 2xi) + 2x^2 i$

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

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

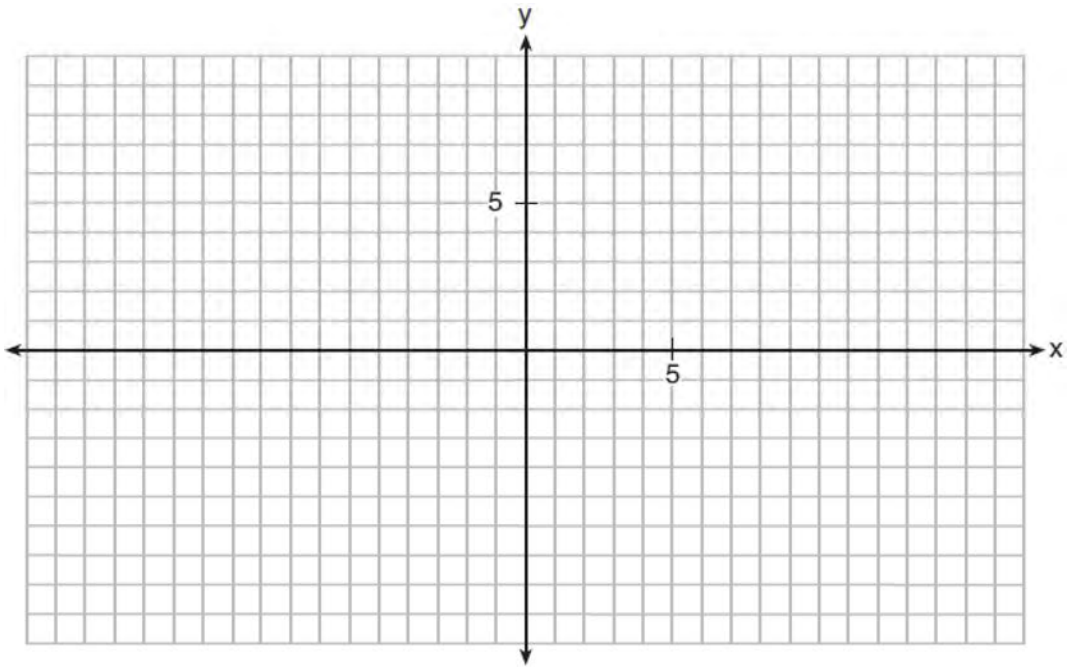
652 Solve algebraically for all values of x:
$\sqrt{x+5} - x = 3$

653 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.
Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.

654 In a recent online contest with a large number of randomly selected human players, the computer player won 67% of the time. The game-design company claims that the computer player can beat human players 70% of the time. The company runs a simulation of a large number of games, with the same number of human players, assuming that the computer wins 70% of the time. The simulation is approximately normal with a mean of 0.705 and a standard deviation of 0.045. Does the contest result provide evidence to contradict the designer's claim? Use the simulation results to justify your answer.

655 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.

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



657 Use the geometric series formula to determine the total 30-year earnings for an employee whose first-year salary is $42,000 and earns an annual raise of 3%, rounded to the *nearest thousand dollars*.

658 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%.

659 When $\left(\frac{1}{\sqrt[3]{y^2}}\right)y^4$ is written in the form y^n, what is the value of *n*? Justify your answer.

660 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$
$$y = 11 - 2x$$

661 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.

662 Express the fraction $\frac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$ in simplest radical form.

663 Natalia's teacher has given her the following information about angle θ.

- $\pi < \theta < 2\pi$
- $\cos\theta = \frac{\sqrt{3}}{4}$

Explain how Natalia can determine if the value of $\tan\theta$ is positive or negative.

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

665 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.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	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.

666 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.

667 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.

668 Algebraically determine the solution to the equation $\sqrt{x-2}+x=4$.

669 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.

670 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 $y \neq 0$.

671 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*.

672 Write the expression $A(x) \bullet B(x) - 3C(x)$ as a polynomial in standard form.

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

$$B(x) = x^2 + 7$$

$$C(x) = x^4 - 5x$$

673 Over the set of integers, completely factor $x^4 - 5x^2 + 4$.

674 Given i is the imaginary unit, simplify $(5xi^3 - 4i)^2$ as a polynomial in standard form.

675 Solve $3.8e^{1.5t} = 16$ algebraically for t to the *nearest hundredth*.

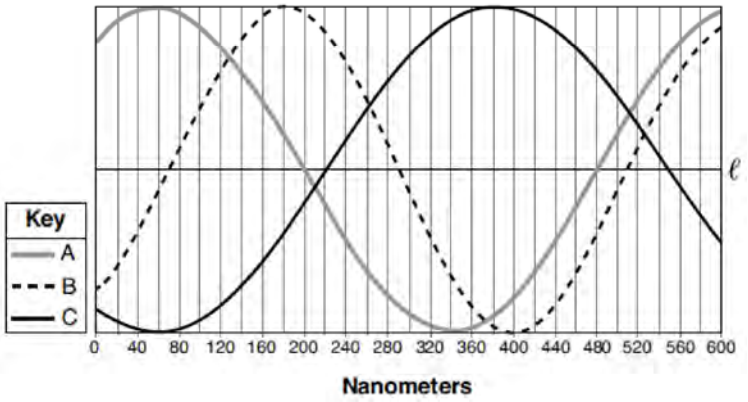
676 Write a recursive formula for the sequence $6, 9, 13.5, 20.25, \ldots$

677 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.

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

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

679 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 ℓ.

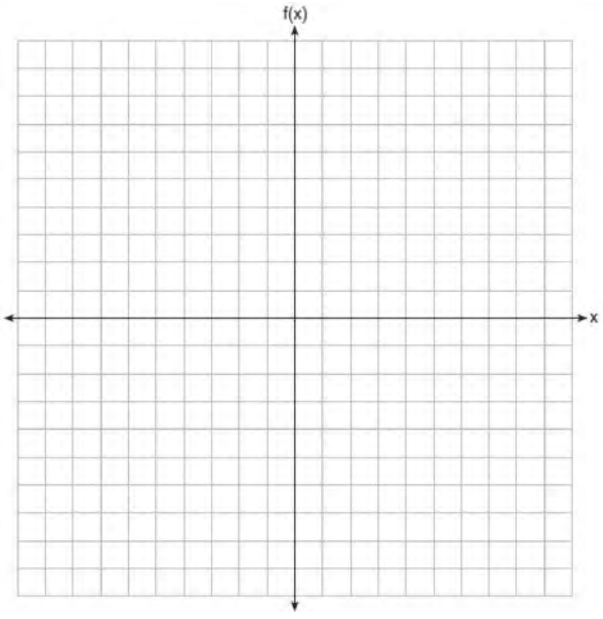


Based on the graph, which light wave has the longest period? Justify your answer.

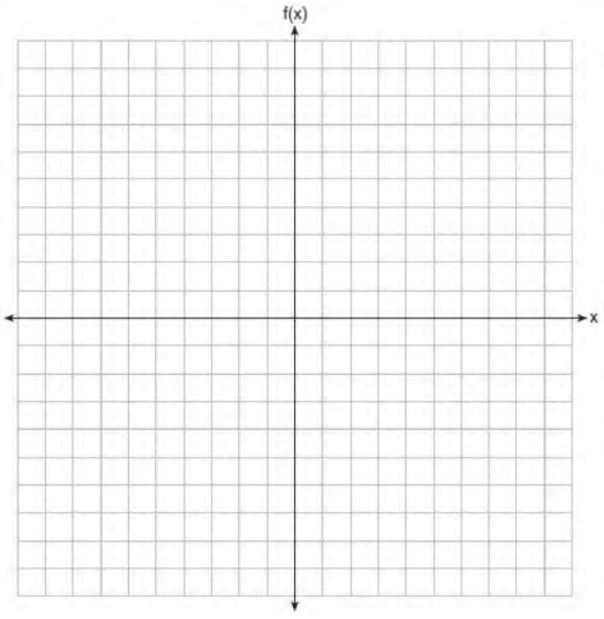
680 The table below shows the results of gender and music preference. Based on these data, determine if the events "the person is female" and "the person prefers classic rock" are independent of each other. Justify your answer.

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

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



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

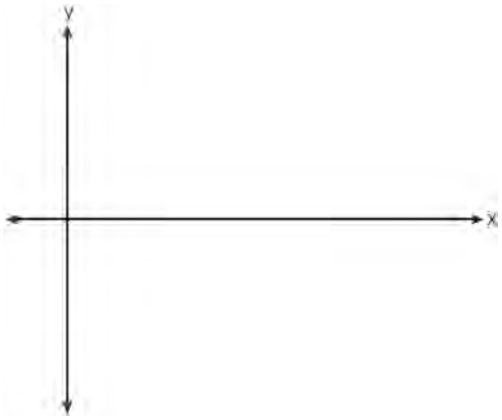


683 Seniors at a high school were surveyed to see if they preferred a hoodie or a jacket for Spirit Day and if they wanted a design on the back or the front. The survey results are summarized in the table below.

	Hoodie	**Jacket**
Back	45	15
Front	27	13

Determine the exact probability that a randomly selected senior from the survey preferred a hoodie, given that the senior wanted a design on the back.

684 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 $\frac{\pi}{2}$.



685 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.

686 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.

687 Express $(1-i)^3$ in $a+bi$ form.

688 Express $\left(2xi^3 - 3y\right)^2$ in simplest form.

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

690 Algebraically determine the values of x that satisfy the system of equations below.

$$y = -2x + 1$$

$$y = -2x^2 + 3x + 1$$

691 Given $\cos\theta = -\frac{2}{7}$ with θ in Quadrant II, find the exact value of $\sin\theta$.

692 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.

693 Solve the equation $3x^2 + 5x + 8 = 0$. Write your solution in $a + bi$ form.

694 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.

695 Factor the expression completely:
$(x-1)^2+5(x-1)-6$

696 Given that $\left(\frac{y^{\frac{17}{8}}}{y^{\frac{5}{4}}}\right)^{-4}=y^n$, where $y>0$, determine the value of n.

697 Write $\sqrt[3]{x}\bullet\sqrt{x}$ as a single term with a rational exponent.

698 Solve algebraically for x to the *nearest thousandth*:
$2e^{0.49x}=15$

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

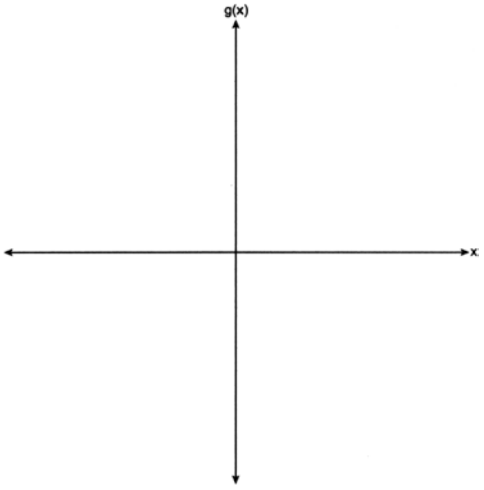
700 At Andrew Jackson High School, students are only allowed to enroll in AP U.S. History if they have already taken AP World History or AP European History. Out of 825 incoming seniors, 165 took AP World History, 66 took AP European History, and 33 took both. Given this information, determine the probability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

701 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.

702 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.

703 Factor the expression $x^3-2x^2-9x+18$ completely.

704 Sketch $g(x)=-x^3-7x^2+36$ on the axes below, including appropriate end behavior and zeros.



705 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.

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

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

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

708 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.

709 An angle, θ, is in standard position and its terminal side passes through the point $(2,-1)$. Find the *exact* value of $\sin\theta$.

710 Solve algebraically for all values of x:
$\sqrt{x-4}+x=6$

Algebra II 4 Point Regents Exam Questions

711 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.

712 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

$$p(x) = 3^x + 1$$

713 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.

714 Write an explicit formula for a_n, the nth 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 $n > 1$?

715 Consider the function $f(x)$ below. Is $(x+3)$ a factor of $f(x)$? Justify answer.

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

Determine all zeros of $f(x)$.

716 Solve the system of equations shown below algebraically:

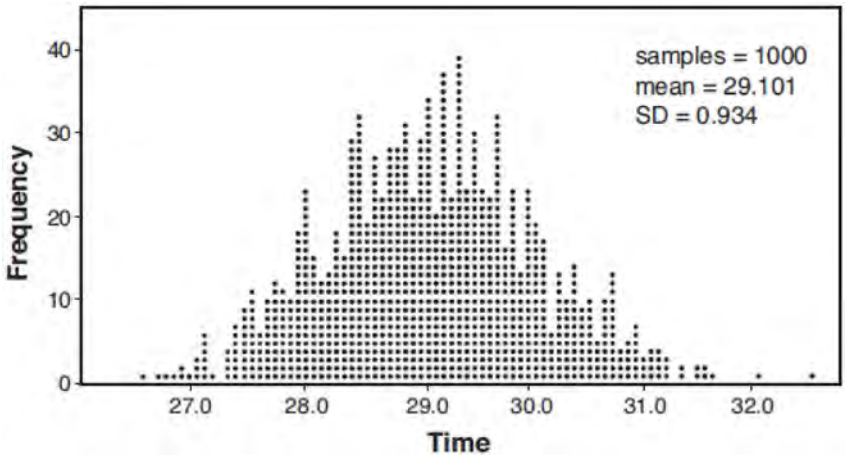
$$(x-4)^2 + (y-1)^2 = 9$$

$$x - y = 6$$

717 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*.

718 The monthly high temperature (°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.

719 Solve the system of equations shown below algebraically.

$$(x-3)^2 + (y+2)^2 = 16$$

$$2x + 2y = 10$$

720 Solve the given equation algebraically for all values of x. $3\sqrt{x} - 2x = -5$

721 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?

722 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.

723 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 $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ 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.

724 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.

725 Algebraically solve the following system of equations.

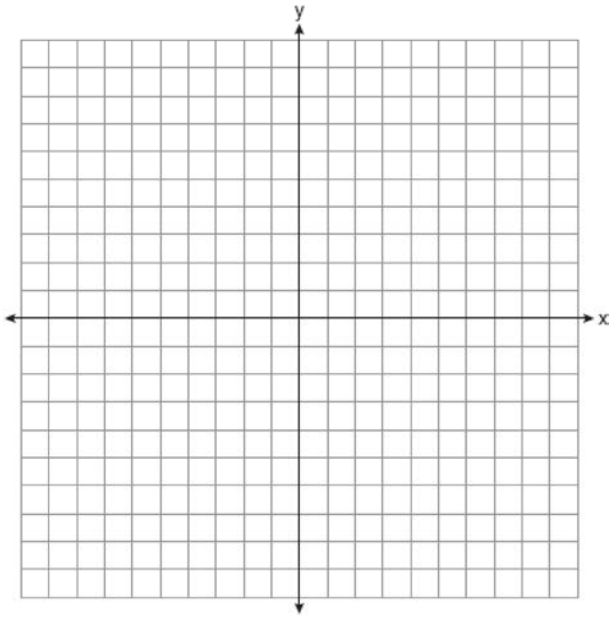
$$(x-2)^2 + (y-3)^2 = 16$$

$$x + y - 1 = 0$$

726 For $c(x) = 3x^2 - 4x + 7$ and $d(x) = x - 2$, determine $c(x) \bullet d(x) - [d(x)]^3$ as a polynomial in standard form.

727 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.

728 Graph $y = f(x)$, where $f(x) = \log_2(x-1) + 3$ on the set of axes below.



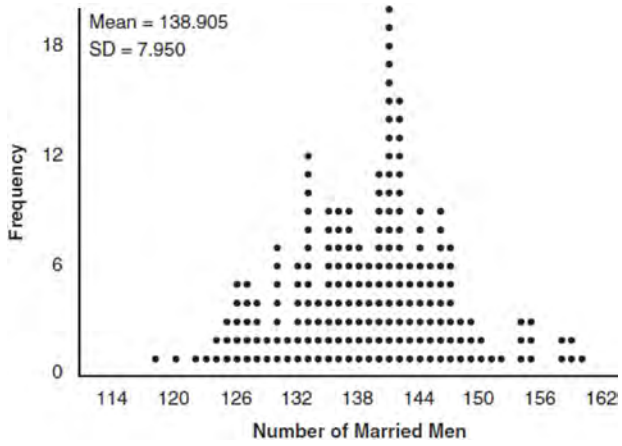
State the equation of the asymptote of $f(x)$. When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$. State the equation of the asymptote of $g(x)$.

729 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

$$g(x) = 4x^3 - 5x^2 + 3$$

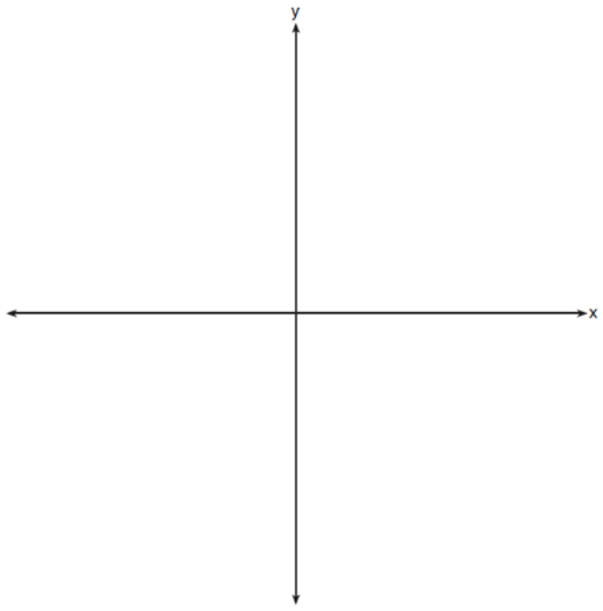
730 In a random sample of 250 men in the United States, age 21 or older, 139 are married. The graph below simulated samples of 250 men, 200 times, assuming that 139 of the men are married.



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*.

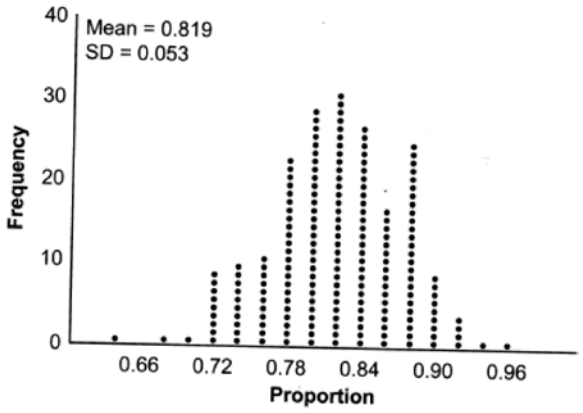
b) A study claims "50 percent of men 21 and older in the United States are married." Do your results from part a contradict this claim? Explain.

731 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 2π.



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.

732 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.

733 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.

734 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.

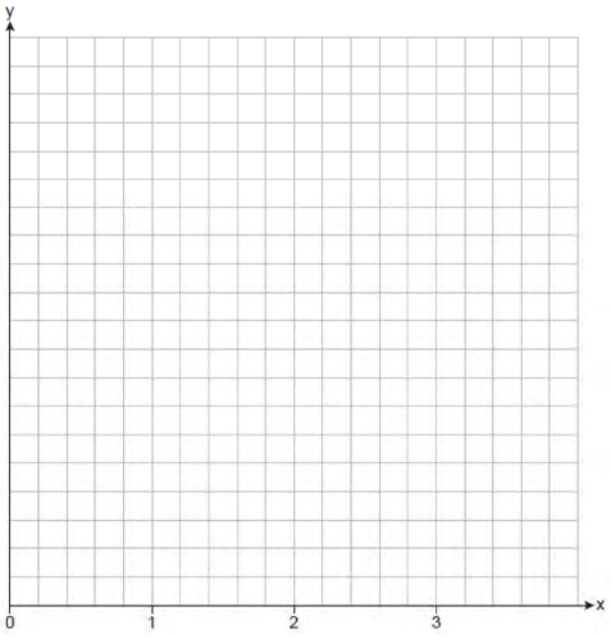
735 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) 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.

b) 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.

736 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.

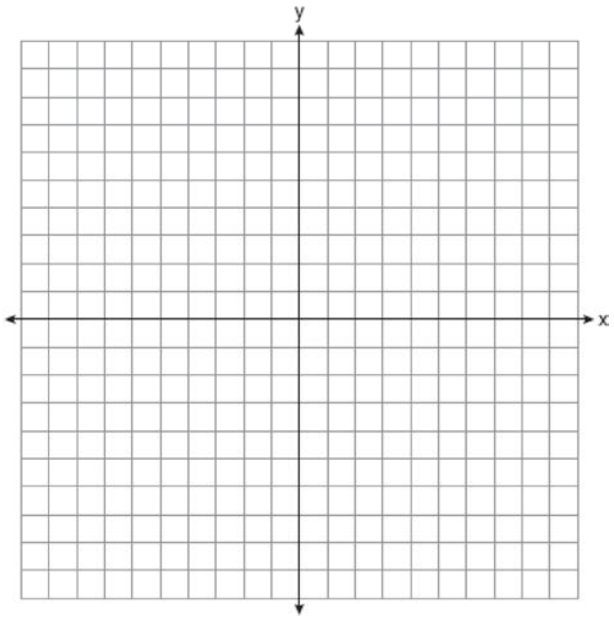
737 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \le x \le 3$. Graph $y = v(x)$ over the domain $0 \le x \le 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

738 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.

739 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*.

740 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.

741 Algebraically solve for *x*: $2x = 6 + 2\sqrt{x - 1}$

742 Solve the system of equations algebraically.

$$x^2 + y^2 = 25$$

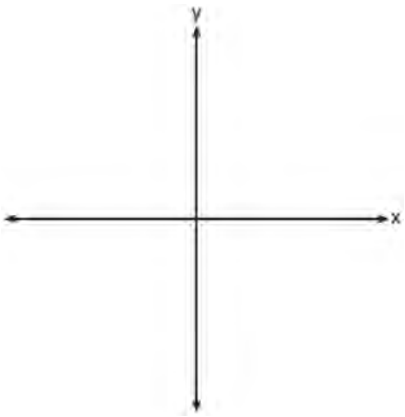
$$y + 5 = 2x$$

743 Solve algebraically for all values of *x*:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

744 Solve for all values of *p*: $\frac{3p}{p-5} - \frac{2}{p+3} = \frac{p}{p+3}$

745 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$. On the axes below, sketch $y = c(x)$.



746 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

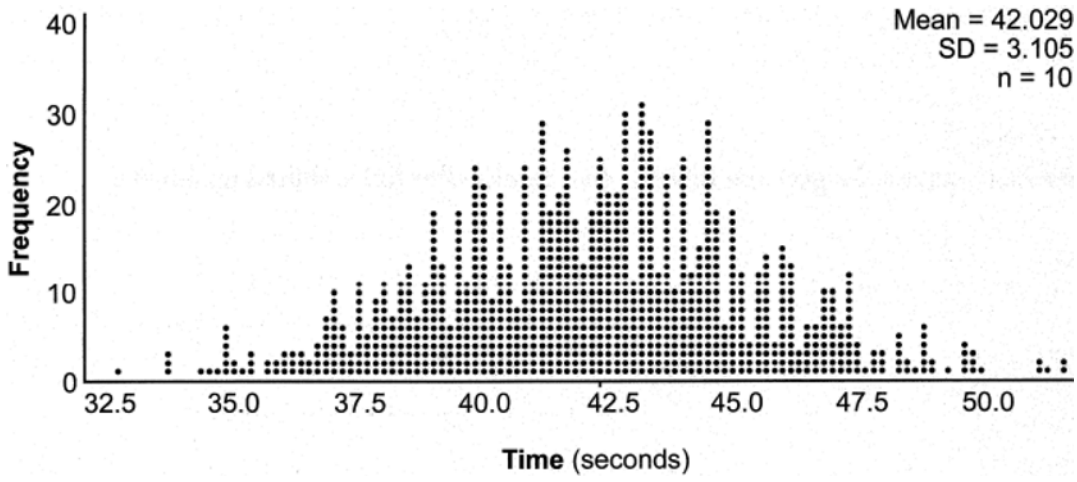
To the *nearest thousandth*, find the probability that a randomly selected donor was categorized as a supporter, given that the donation was made online. Do these data indicate that being a supporter is independent of donating online? Justify your answer.

747 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

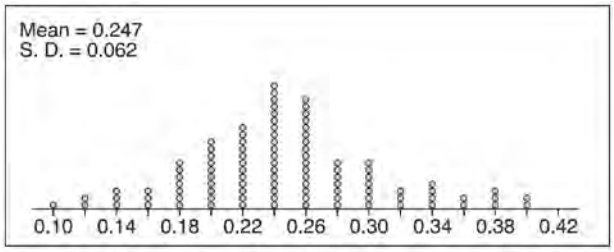
Which country's population had a greater average rate of change between 1950 and 2020? Justify your answer.

748 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.

749 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.

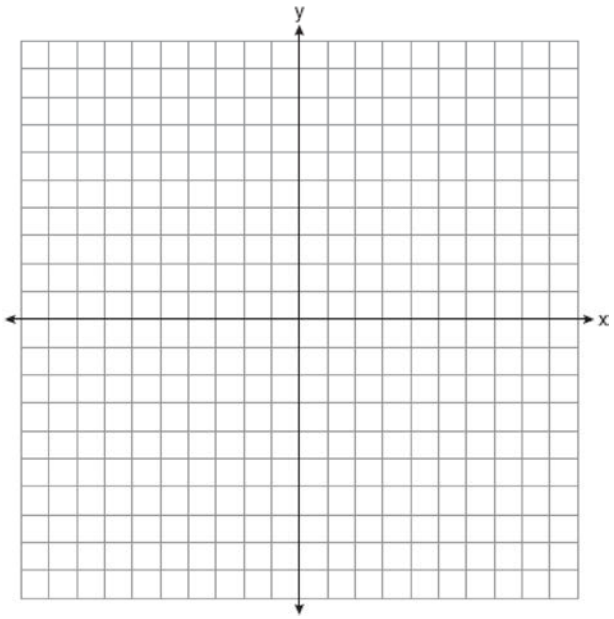


Proportion Preferring Stephen's Product

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.

750 A highly selective college reports that the mean score earned by accepted students on the Mathematics Level 2 subject test is 750 with a standard deviation of 20 and that the scores are approximately normally distributed. Given this information, determine the interval representing the middle 95% of student scores. To the *nearest whole percent*, determine the percentage of accepted students who scored a 760 or less.

751 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$. On the set of axes below, graph $y = p(x)$.



752 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*.

753 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.

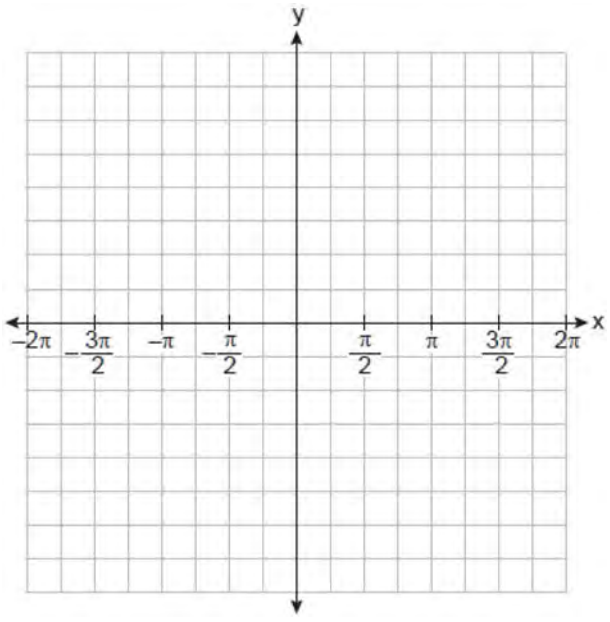
754 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$. Is $x = 4$ a root of $f(x)$? Explain your answer.

755 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

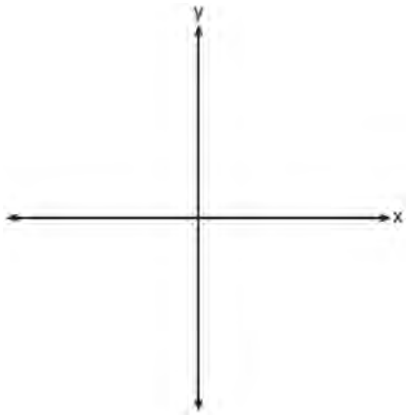
Determine the probability that a randomly selected survey respondent is allergic to milk. Determine the probability that a randomly selected survey respondent is allergic to milk, given that the person is allergic to nuts. Based on the survey data, determine whether nut allergies and milk allergies are independent events. Justify your answer.

756 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 π, and a midline at $y = 2$.



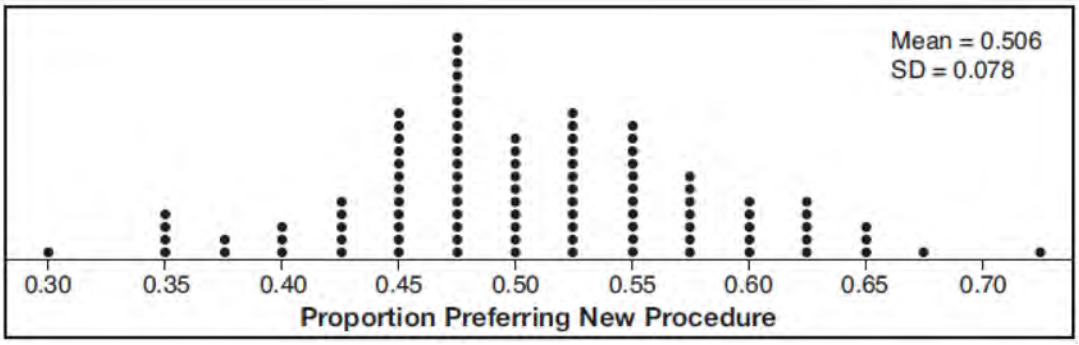
Based on your graph, state an interval in which the graph is increasing.

757 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.



758 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.

759 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.

760 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 nth 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.

761 Solve the equation $\sqrt{2x-7}+x=5$ algebraically, and justify the solution set.

762 Solve the equation $\sqrt{49-10x}+5=2x$ algebraically.

763 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.

764 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 $j(x)$.

765 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.

766 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 $g(x)$.

767 After sitting out of the refrigerator for a while, a turkey at room temperature (68°F) is placed into an oven at 8 a.m., when the oven temperature is 325°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:

$$T = T_a + \left(T_0 - T_a\right)e^{-kt}$$

T_a = the temperature surrounding the object

T_0 = the initial temperature of the object

t = the time in hours

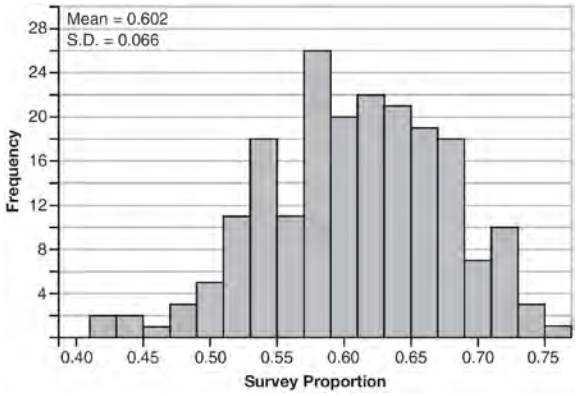
T = the temperature of the object after t hours

k = decay constant

The turkey reaches the temperature of approximately 100° 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.

768 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*.

769 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.



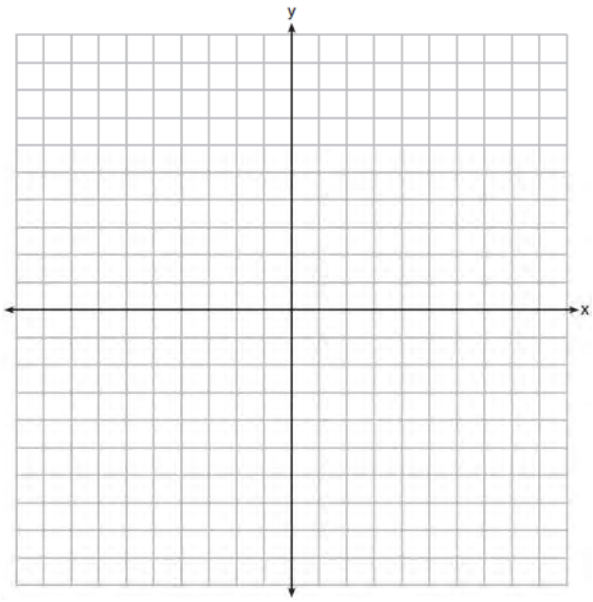
Using the results of the simulation, determine a plausible interval containing the middle 95% of the data. Round all values to the *nearest hundredth*. Members of the prom committee are concerned that a vote of all students attending the prom may produce a 50% – 50% split. Explain what statistical evidence supports this concern.

770 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 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.

771 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

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

$$g(x) = 2x - 5$$



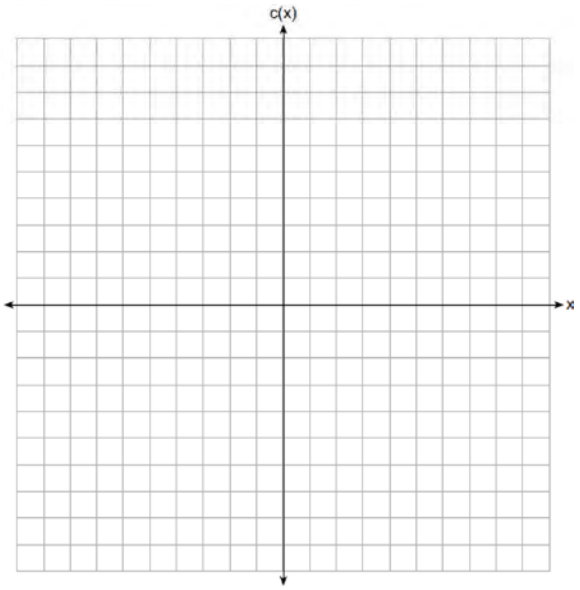
State the number of solutions to the equation $f(x) = g(x)$.

772 Algebraically solve the system:

$$(x-2)^2 + (y-3)^2 = 20$$

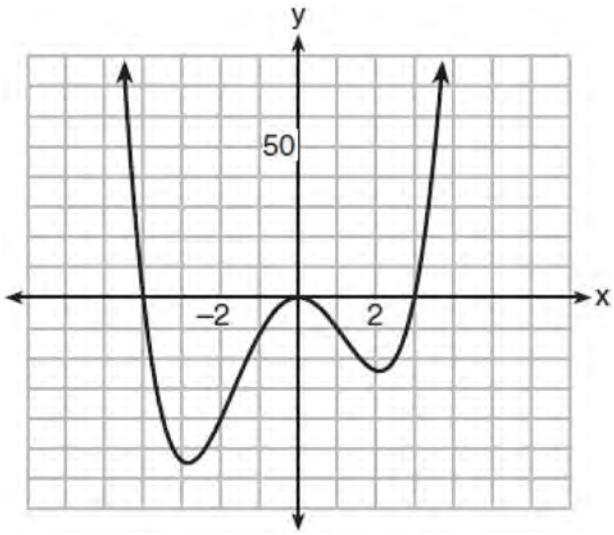
$$y = -2x + 7$$

773 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.

774 The graph of $y = f(x)$ is shown below. The function has a leading coefficient of 1.



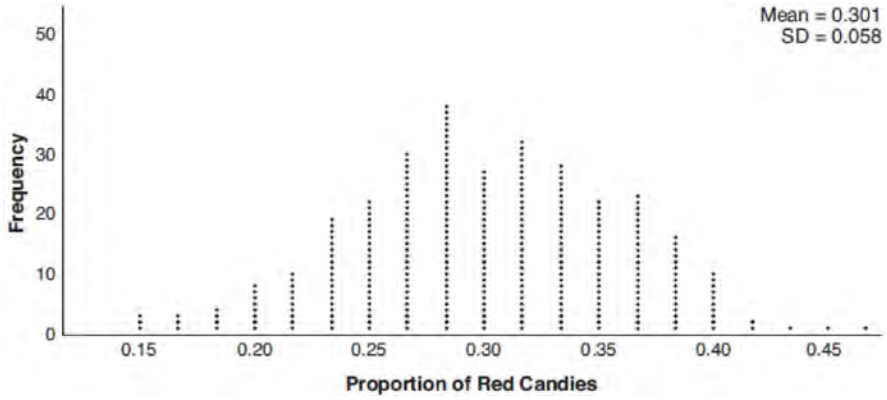
Write an equation for $f(x)$. The function *g* is formed by translating function *f* left 2 units. Write an equation for $g(x)$.

775 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.

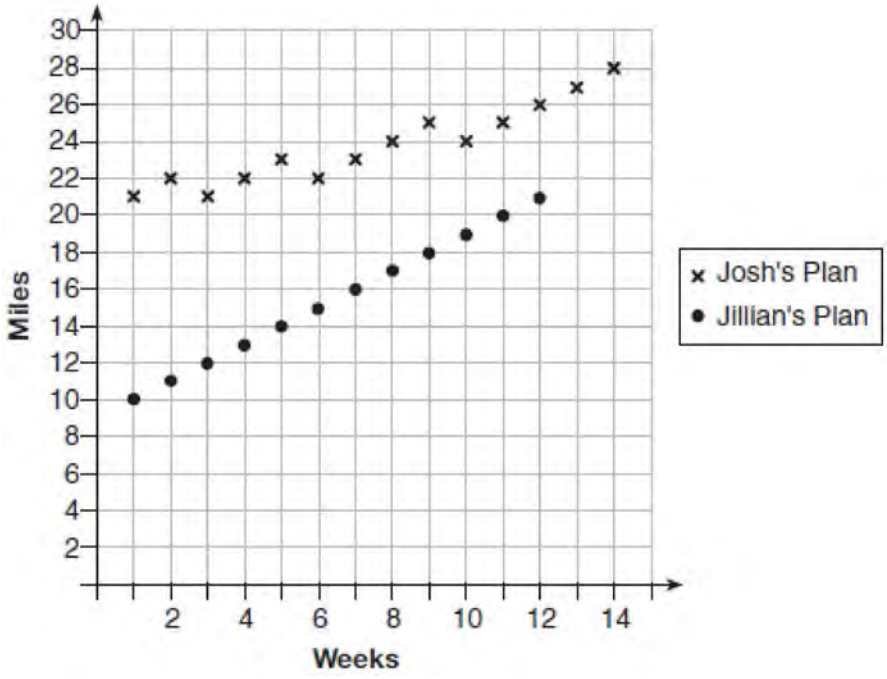
776 Mary bought a pack of candy. The manufacturer claims that 30% of the candies manufactured are red. In her pack, 14 of the 60 candies are red. She ran a simulation of 300 samples, assuming the manufacturer is correct. The results are shown below.



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.

777 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 $1 \le t \le 2$. At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \le t \le 5$? Justify your answer.

778 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.

779 Solve algebraically for x: $\frac{2}{x} = \frac{2x+3}{x-4}$. Express your answers in simplest $a+bi$ form.

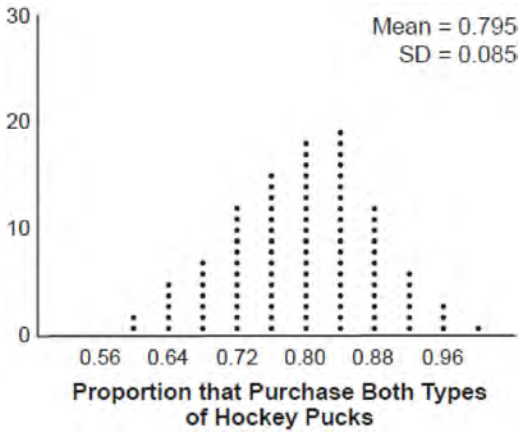
780 Given $z(x) = 6x^3 + bx^2 - 52x + 15$, $z(2) = 35$, and $z(-5) = 0$, algebraically determine all the zeros of $z(x)$.

781 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.

782 Given: $f(x) = 5x^2 + 3x - 12$ and $g(x) = 2x - 1$. Express $4g(x) - [f(x+1)]$ as a polynomial in standard form.

783 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.

784 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.

785 Christopher works for a defense contractor and earned $85,000 his first year. For each additional year he will receive a 2.5% raise. Write a geometric series formula, C_n, for Christopher's total earnings over n years. Use this formula to find Christopher's total earnings, to the nearest hundred dollars, over his first 10 years of employment.

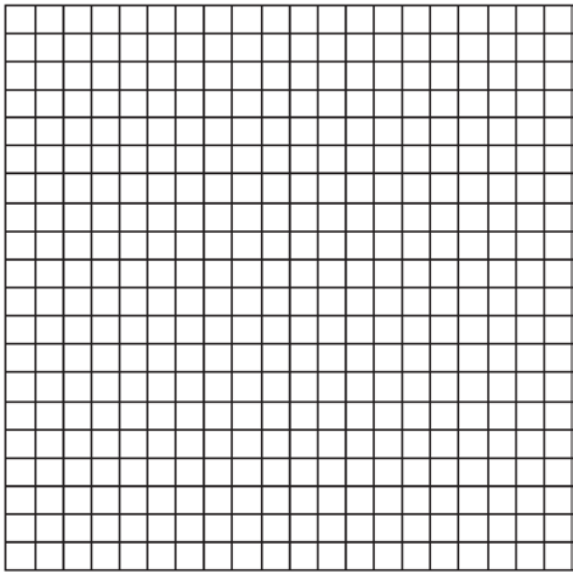
786 Monthly mortgage payments can be found using the formula below:

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

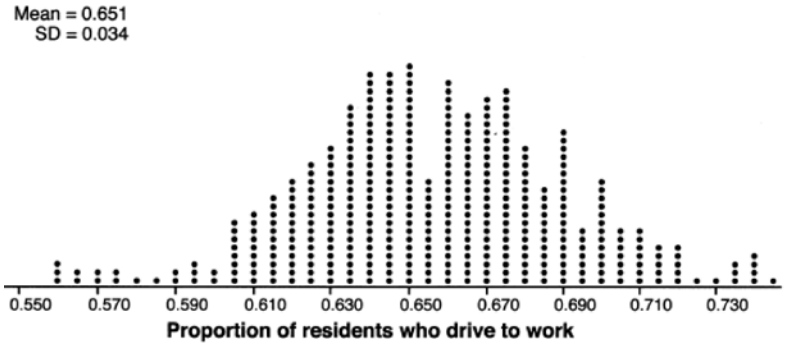
M = monthly payment
P = amount borrowed
r = annual interest rate
n = number of monthly payments

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.

787 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 2π.



788 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.

789 The gross domestic product (GDP) per capita measures worldwide economic output per person. The GDP per capita, *y*, in dollars, *x* years after 1990 is listed in the table below.

x	y
1	9680
6	10,201
18	13,713
25	15,552
29	16,976

(a) Based on these data, write an exponential regression equation to model the GDP per capita, in dollars, *x* years after 1990. Round all coefficients to the *nearest hundredth*. (b) Use the rounded equation from part *a* to algebraically determine, to the *nearest tenth of a year*, the number of years after 1990 when GDP per capita was $15,000.

790 Solve for *x* algebraically:

$$\frac{1}{x-6}+\frac{x}{x-2}=\frac{4}{x^2-8x+12}$$

791 Given: $f(x)=2x^2+x-3$ and $g(x)=x-1$
Express $f(x)\bullet g(x)-[f(x)+g(x)]$ as a polynomial in standard form.

792 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*.

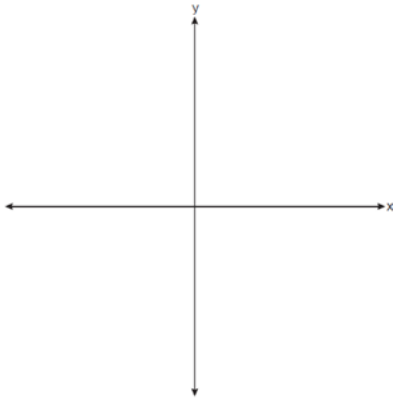
$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

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*.

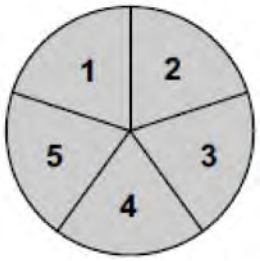
793 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let A be the event that the guest room has a view of the lake, and let B be the event that the guest room has a queen-size bed. Events A and B 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.

794 Sketch $p(x) = -\log_2(x+3) + 2$ on the axes below.

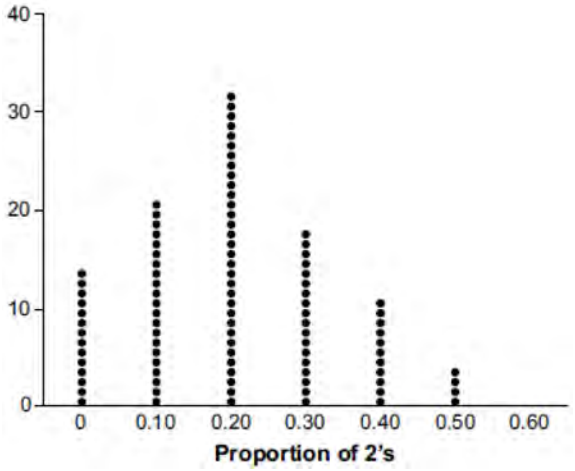


Describe the end behavior of $p(x)$ as $x \to -3$.
Describe the end behavior of $p(x)$ as $x \to \infty$

795 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.

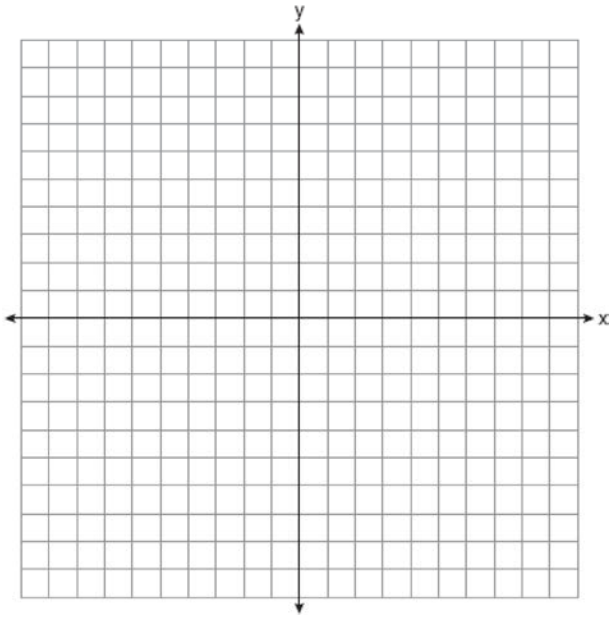


She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game. State the proportion of 2's that were spun. State the theoretical probability of spinning a 2. The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.



Does the output indicate that the carnival game was unfair? Explain your answer.

796 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.

Algebra II 6 Point Regents Exam Questions

1 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.

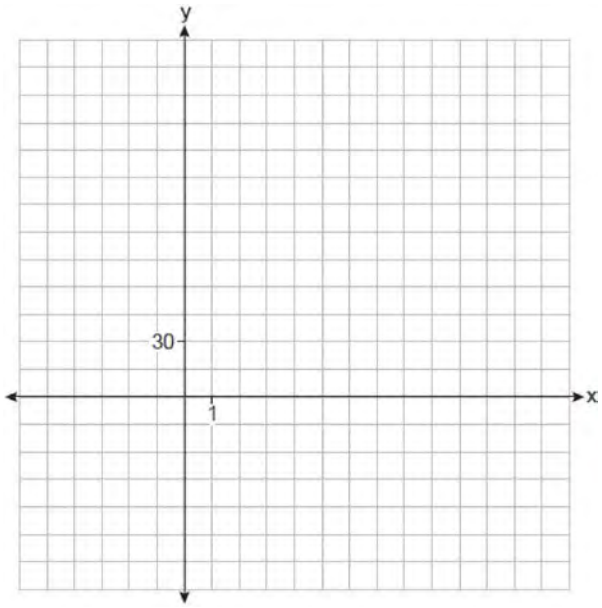
2 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t 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*.

3 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.

4 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 $0 \le x \le 9$, on the set of axes below.

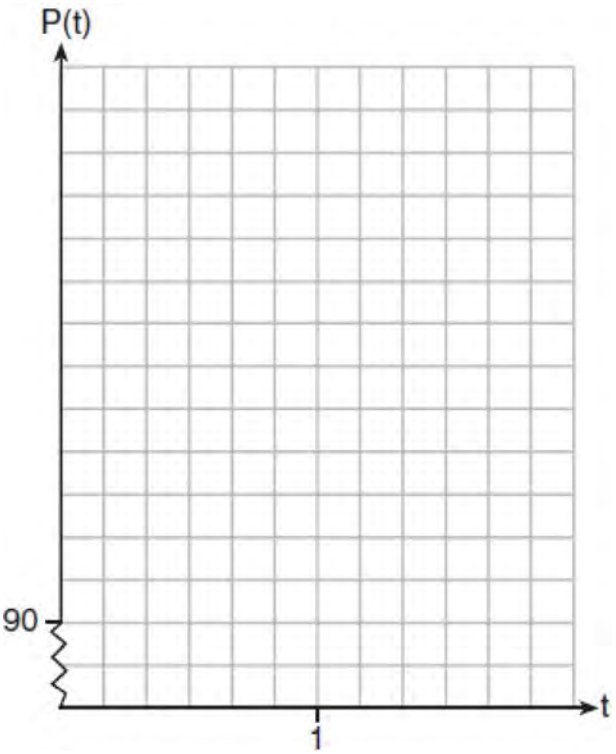


Over the given interval, state the coordinates of the maximum of p and round all values to the *nearest integer*. Explain what this point represents in terms of the number of sweatshirts sold and profit. Determine how many sweatshirts, to the *nearest whole sweatshirt*, the manufacturer would need to produce in order to first make a positive profit. Justify your answer.

5 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.

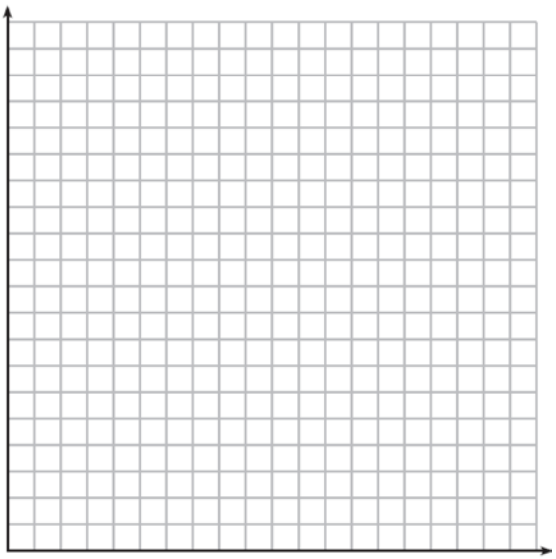
$$P(t) = 24\cos(3\pi t) + 120$$

On the set of axes below, graph $y = P(t)$ over the domain $0 \le t \le 2$.



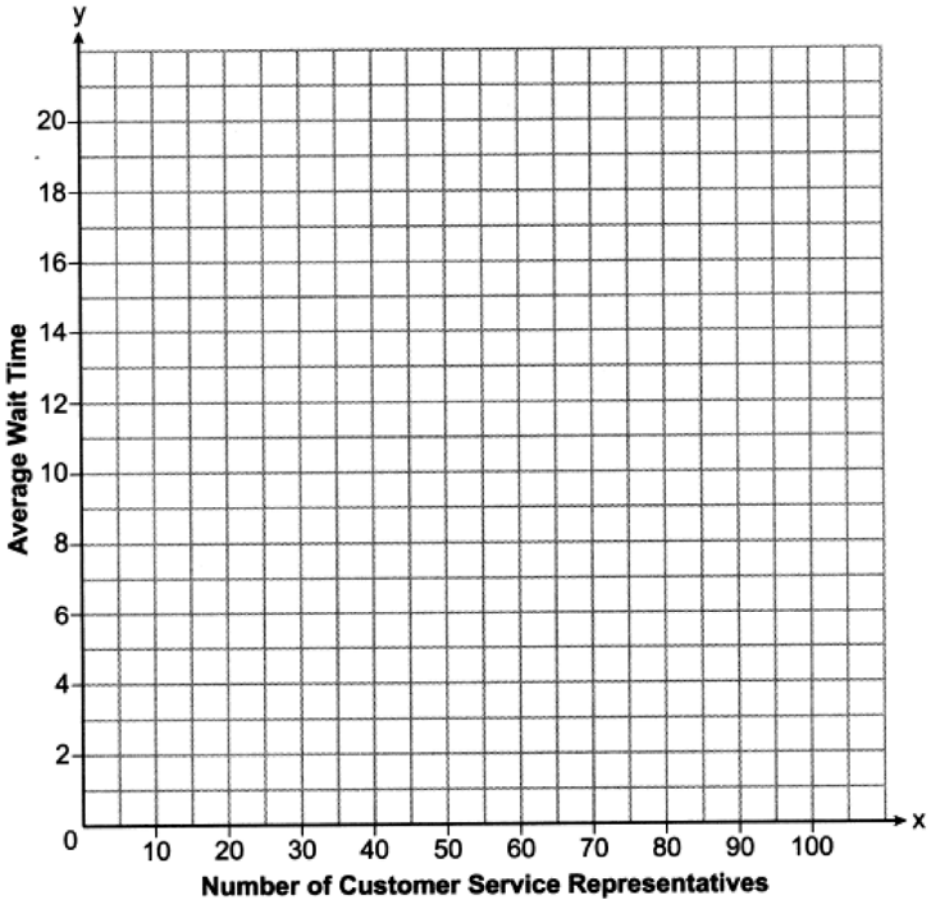
Determine the period of P. Explain what this value represents in the given context. Normal resting blood pressure for an adult is 120 over 80. This means that the blood pressure oscillates between a maximum of 120 and a minimum of 80. Adults with high blood pressure (above 140 over 90) and adults with 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.

6 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 $0 \le t \le 5$, 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.

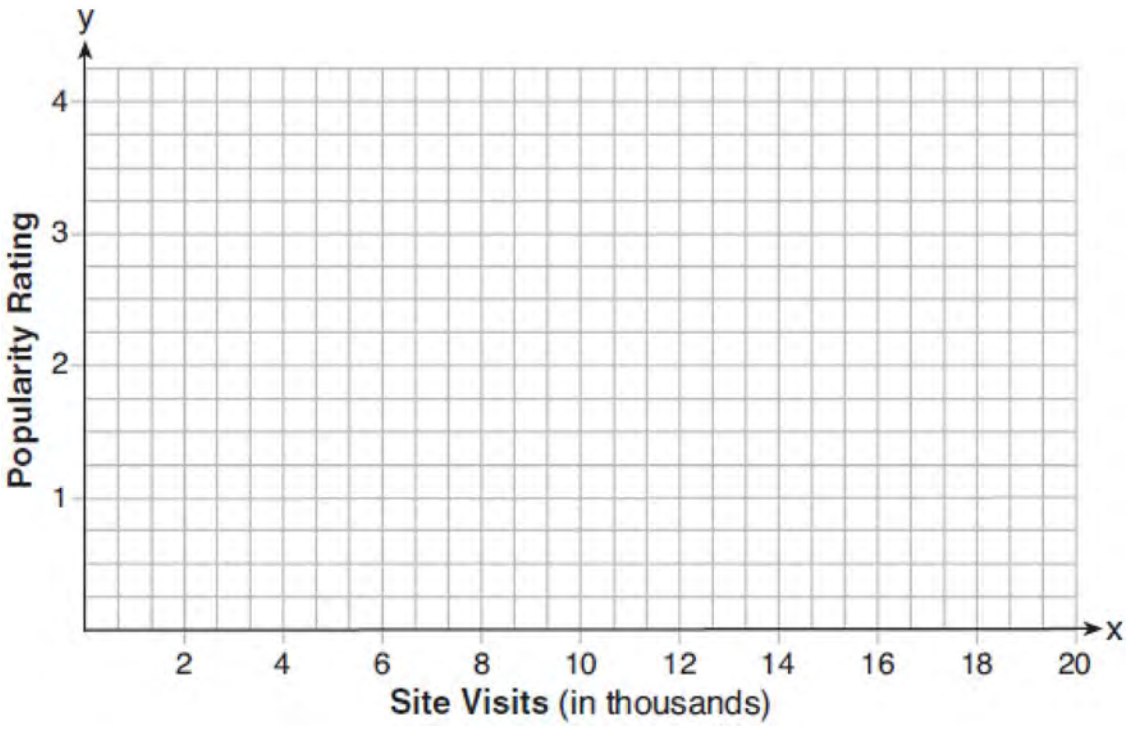
7 A technology company is comparing two plans for speeding up its technical support time. Plan *A* can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan *B* can be modeled by the function $B(x) = 11(0.99)^x$ where *x* is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer. Graph $A(x)$ and $B(x)$ in the interval $0 \le x \le 100$ 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.

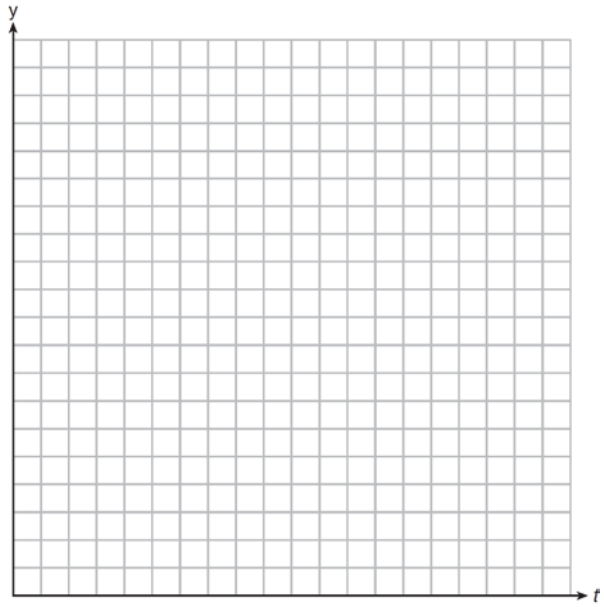
8 Seth's parents gave him $5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly. Write a function of option *A* and option *B* that calculates the value of each account 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.

9 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?

10 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.

11 Megan is performing an experiment in a lab where the air temperature is a constant 73ºF and the liquid is 237ºF. One and a half hours later, the temperature of the liquid is 112ºF. 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

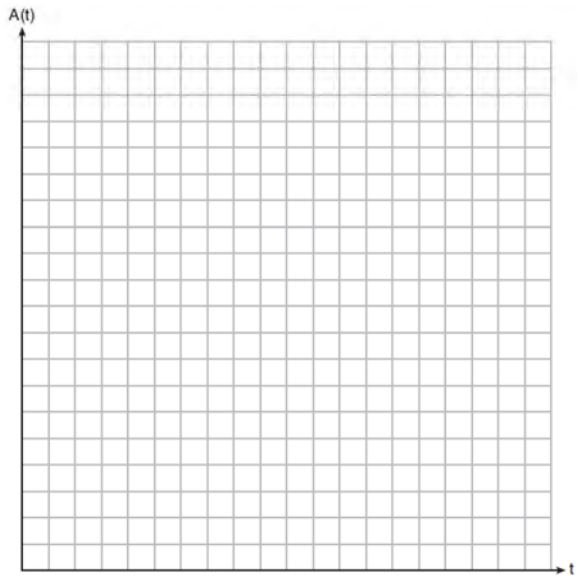
T_a: air temperature

T_0: initial temperature of the liquid

k: constant

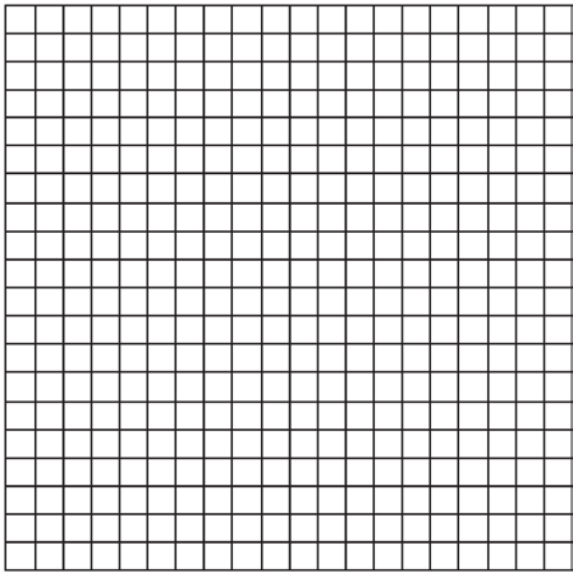
Determine the value of k, to the *nearest thousandth*, for this liquid. Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours. Megan needs the temperature of the liquid to be 80ºF to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

12 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 $0 \le t \le 20$ 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.

13 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.

14 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*.

15 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.

16 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

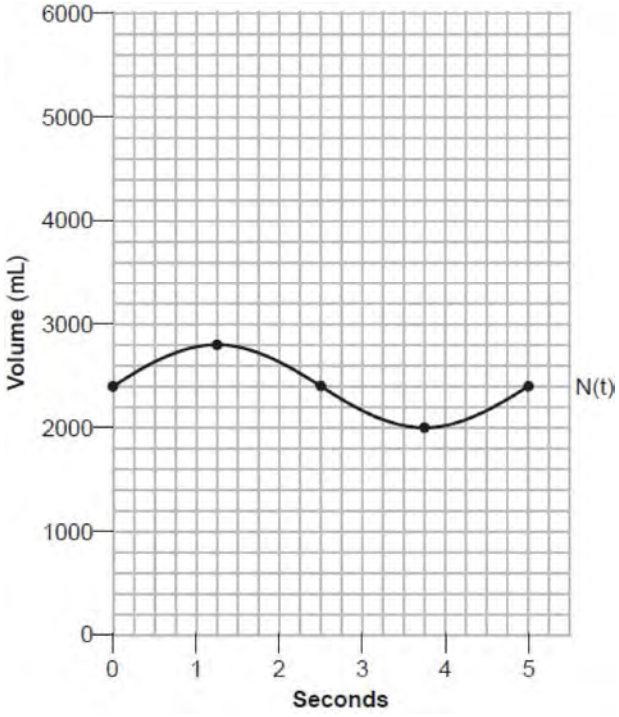
r: rate of cooling of the object

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°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°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°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°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*.

17 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.

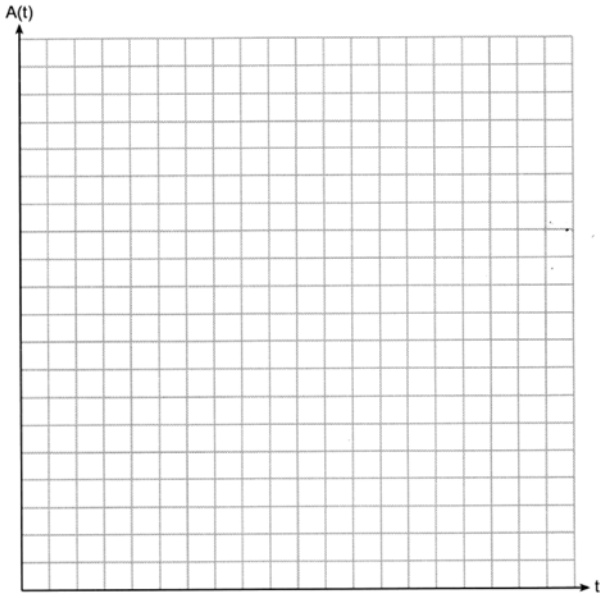
18 The volume of air in an average lung during breathing can be modeled by the graph below.



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 $N(t) = E(t)$?

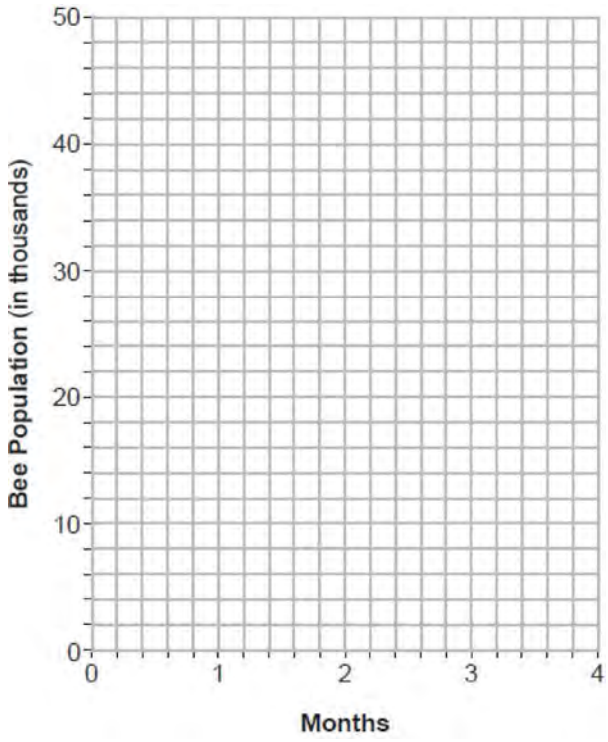
19 Taylor wants to open an investment account with the $1200 she received for her birthday. She has narrowed her choices down to two banks. America's Bank offers 6.4% annual interest compounded quarterly. Barnyard Bank offers 6.35% annual interest compounded continuously. Write functions for $A(t)$ and $B(t)$ 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.

20 Cesium-137 decay can be modeled with the formula $A(t) = A_0 e^{kt}$, where $A(t)$ represents the mass remaining in grams after t years and A_0 represents the initial mass. A sample of 500 grams of cesium-137 takes approximately 60.34 years to decay to 125 grams. Use this sample with the given formula to determine the constant k, to the *nearest thousandth*. Use this value for k to write a function, $A(t)$, that will find the mass of the 500-gram sample remaining after any amount of time, t, in years. Graph $A(t)$ on the graph below from $t = 0$ to $t = 150$ years.



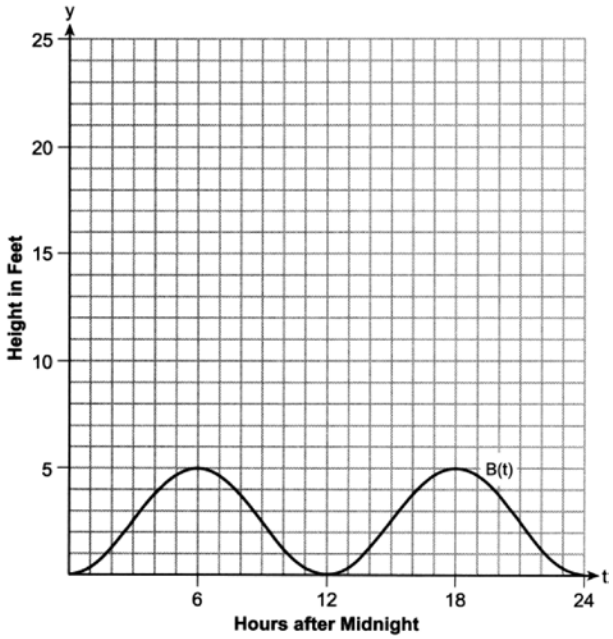
Use $A(t)$ to calculate the average rate of change in grams per year, from $t = 0$ to $t = 60$ years, to the *nearest tenth*. Explain what this value means in the given context.

21 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 $0 \le t \le 4$.



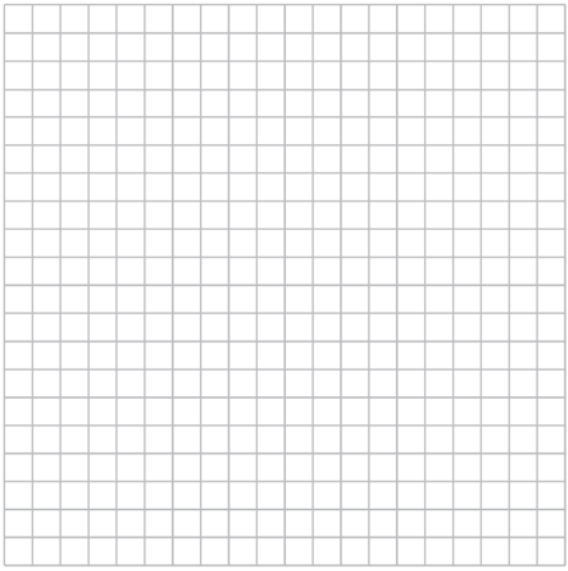
State, to the *nearest tenth of a month*, when the colonies will have the same population. Determine algebraically how long it will take, to the *nearest tenth of a month*, for the population in Colony A to triple.

22 The height, in feet, of the tides along the coastlines can be measured with water levels oscillating between low tide and high tide. The graph below shows the height of the tides, $y = B(t)$, in feet, in Daytona Beach, t hours after midnight on a day in July.



State the period of $B(t)$, in hours. Write an equation for $B(t)$ in the form $B(t) = a\cos(bt) + c$. In Derby, Australia, the height of the tide, in feet, can be modeled by the function $D(t) = 8\cos\left(\frac{\pi}{6}t\right) + 16.5$. On the grid above, graph $y = D(t)$ on the domain $0 \le t \le 24$. State the height, in feet, of the low tide in Derby.

23 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.

24 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

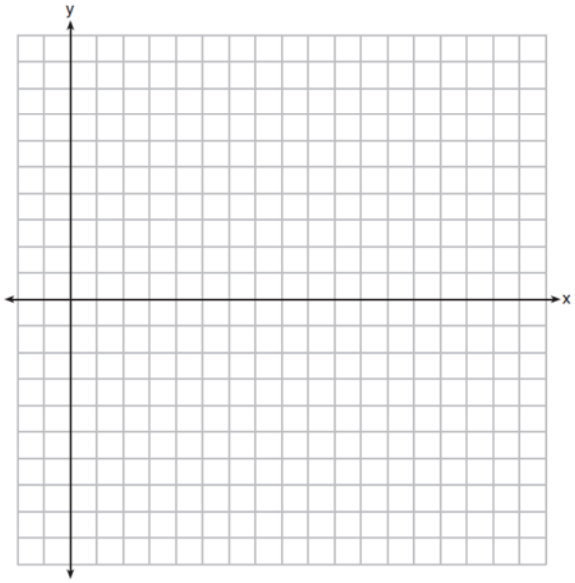
Using the table above, classify the force of wind at a speed of 30 mph. Justify your answer. In 1946, the scale was extended to accommodate strong hurricanes. A strong hurricane received a B value of exactly 15. Algebraically determine the value of s, to the *nearest mph*. Any B values that round to 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.

25 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 $2 \le x \le 16$.



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.

Algebra II Multiple Choice Regents Exam Questions
Answer Section

1 ANS: 3 REF: 012418aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

2 ANS: 4

$$6\left(2^{x+4}\right) = 36$$

$$\ln 2^{x+4} = \ln 6$$

$$(x+4)\ln 2 = \ln 6$$

$$x+4 = \frac{\ln 6}{\ln 2}$$

$$x = \frac{\ln 6}{\ln 2} - 4$$

REF: 082408aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

3 ANS: 2 REF: 082505aii NAT: S.IC.B.3 TOP: Analysis of Data

4 ANS: 3

$$.71 + .52 - .77 = .46$$

REF: 062509aii NAT: S.CP.B.7 TOP: Addition Rule

5 ANS: 2

$$2^x - 4 > 0$$

$$2^x > 4$$

$$x > 2$$

REF: 082402aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

6 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: 062404aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

7 ANS: 3

$$2(i^3)x^2 + 3(i^2)x - ix$$

$$2(-i)x^2 + 3(-1)x - ix$$

$$-2ix^2 - 3x - ix$$

REF: 062506aii NAT: N.CN.A.2 TOP: Imaginary Numbers

8 ANS: 4

$P(B) \cdot P(P|B) = P(P \text{ and } B)$

$.68 \cdot P(P|B) = .49$

$P(P|B) = .72$

REF: 062416aii NAT: S.CP.A.3 TOP: Conditional Probability

9 ANS: 1

$a_7 = -2(-3)^{7-1} = -1458$

REF: 082501aii NAT: F.BF.A.2 TOP: Sequences KEY: explicit

10 ANS: 3

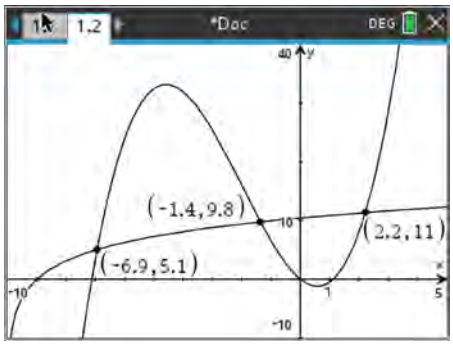
$p(x) = r(x) - c(x)$

$-15x^2 + 600x + 60 = -0.4x^2 + 130x + 1200 - c(x)$

$c(x) = 14.6x^2 - 470x + 1140$

REF: 062421aii NAT: F.BF.A.1 TOP: Operations with Functions

11 ANS: 4



REF: 082514aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

12 ANS: 4 REF: 062516aii NAT: A.CED.A.1 TOP: Modeling Rationals

13 ANS: 3 REF: 012401aii NAT: S.IC.B.3 TOP: Analysis of Data

14 ANS: 1 REF: 082406aii NAT: S.ID.B.6 TOP: Regression
KEY: choose model

15 ANS: 4

$p(2) = 4(2)^3 - 3(2) + 3 = 29$

REF: 062422aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

16 ANS: 4 REF: 012501aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: radians

17 ANS: 4

$$\begin{array}{r} 6x^3 - 8x^2 + 16x - 31 \\ x+2\overline{)\,6x^4 + 4x^3 + 0x^2 + x + 200} \\ \underline{6x^4 + 12x^3} \\ -8x^3 + 0x^2 \\ \underline{-8x^3 - 16x^2} \\ 16x^2 + x \\ \underline{16x^2 + 32x} \\ -31x + 200 \\ \underline{-31x - 62} \\ 262 \end{array}$$

REF: 082407aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

18 ANS: 2

$\frac{1}{x} - \frac{1}{5} = \frac{x}{5}$ $b^2 - 4ac = 1^2 - 4(1)(-5) = 1 + 20 = 21$, which is not a perfect square.

$\frac{1}{x} = \frac{x+1}{5}$

$x^2 + x = 5$

$x^2 + x - 5 = 0$

REF: 062522aii NAT: A.REI.A.2 TOP: Solving Rationals

19 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: 012504aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

20 ANS: 4

$y=\sqrt[3]{x+2}$

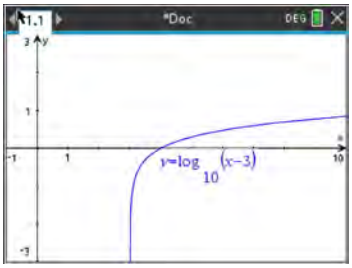
$x=\sqrt[3]{y+2}$

$x^3=y+2$

$y=x^3-2$

REF: 062419aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

21 ANS: 2



REF: 062519aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

22 ANS: 1 REF: 082510aii NAT: A.CED.A.1 TOP: Modeling Rationals

23 ANS: 1

$50\left(1.19^{\frac{1}{12}}\right)^{12t}\approx 50(1.015)^{12t}$

REF: 012424aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

24 ANS: 3

$\frac{1}{3}+\frac{1}{7}-\frac{9}{21}=\frac{7}{21}+\frac{3}{21}-\frac{9}{21}=\frac{1}{21}$

REF: 082410aii NAT: S.CP.B.7 TOP: Addition Rule

25 ANS: 4

$49\times 16.7\%\approx 8$

REF: 062418aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict

26 ANS: 3

$3|\ -2\ \ -11\ \ -12\ \ \ 9$ $x-3$ is not a factor since there is a remainder. $-2|\ -2\ \ -11\ \ -12\ \ \ 9$

$|\ \ \ \ \ -6\ \ -51\ \ -189$ $\qquad |\ \ \ \ \ 4\ \ \ 14\ \ -4$

$-2\ \ -17\ \ -63\ \ -180$ $\qquad -2\ \ -7\ \ \ 2\ \ \ 5$

REF: 062414aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

27 ANS: 3

$x = 2y + 6$

$x - 6 = 2y$

$\frac{x}{2} - 3 = y$

REF: 082503aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

28 ANS: 2

$1 - .965 = .035 = 3.5\%$

REF: 062504aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

29 ANS: 3

$(3x-1)^2 - 5(3x-1) + 6$

$u^2 - 5u + 6$

$(u-3)(u-2)$

$(3x-1-3)(3x-1-2)$

$(3x-4)(3x-3)$

$3(3x-4)(x-1)$

REF: 082519aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

30 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: 012413aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

31 ANS: 1

If $\sin\theta = \frac{7}{25}$, $\cos\theta = -\frac{24}{25}$ in QII, and $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{7}{25}}{\frac{-24}{25}} = -\frac{7}{24}$

REF: 062417aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

32 ANS: 3 REF: 012404aii NAT: F.LE.A.4 TOP: Express Exponentials as Logarithms

33 ANS: 4

$\sqrt[3]{9x^2} \bullet \sqrt{9x} = 9^{\frac{1}{3}} \bullet x^{\frac{2}{3}} \bullet 9^{\frac{1}{2}} \bullet x^{\frac{1}{2}} = 9^{\frac{5}{6}}x^{\frac{7}{6}}$

REF: 082521aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

34 ANS: 2

$3x^2 - 7x + 25 - (7x^2 - 10x + 22) = -4x^2 + 3x + 3$

REF: 012513aii NAT: F.BF.A.1 TOP: Operations with Functions

35 ANS: 3

$\bar{x} + 2\sigma$ represents approximately 99.1% of the data.

REF: 012514aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

36 ANS: 1 REF: 012502aii NAT: S.IC.B.3 TOP: Analysis of Data

37 ANS: 1 REF: 062514aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: radians

38 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.6 TOP: Rational Expressions
KEY: addition and subtraction

39 ANS: 1

$$\text{amplitude} = \frac{8-2}{2} = 3,\ b = \frac{2\pi}{6} = \frac{\pi}{3},\ c = \frac{8+2}{2} = 5$$

REF: 062403aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

40 ANS: 3

$\frac{2}{x^3} + \frac{1}{x} = \frac{6}{x^3}$ 0 is extraneous.

$$\frac{1}{x} = \frac{4}{x^3}$$

$$x^3 = 4x$$

$$x^3 - 4x = 0$$

$$x(x^2-4) = 0$$

$$x = -2, 0, 2$$

REF: 082508aii NAT: A.REI.A.2 TOP: Solving Rationals

41 ANS: 3

$$\sqrt[3]{16x^6} = \sqrt[3]{8}\sqrt[3]{x^6}\sqrt[3]{2} = 2x^2\sqrt[3]{2}$$

REF: 082504aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

42 ANS: 1 REF: 082414aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

43 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 $\frac{4}{30}$.

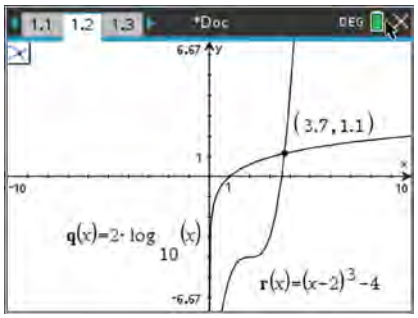
REF: 012518aii NAT: S.CP.A.4 TOP: Conditional Probability

44 ANS: 1

$P = \frac{2\pi}{\frac{2\pi}{3}} = 3$

REF: 082413aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

45 ANS: 2



REF: 082417aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

46 ANS: 3

1) $\frac{(x+2)(x^2-2x-24)}{(x+4)} = \frac{(x+2)(x-6)(x+4)}{(x+4)}$; 3) $\frac{(x-2)(x^2-4x-12)}{(x-6)} = \frac{(x-2)(x-6)(x+2)}{(x-6)}$; 4)

$(x+4)(x-2)-2(3x+2) = x^2+2x-8-6x-4 = x^2-4x-12 = (x-6)(x+2)$

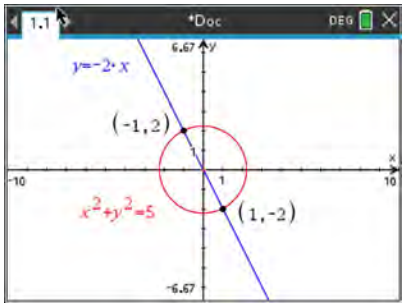
REF: 082506aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

47 ANS: 2

$i = \frac{6.24\%}{12} = .52\%$ $R = \frac{(18000)(.52\%)}{1-(1+.52\%)^{-12\cdot 6}} \approx 300.36$

REF: 012420aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

48 ANS: 4



$x^2 + (-2x)^2 = 5 \quad y = -2(-1) = 2$

$5x^2 = 5$

$x^2 = 1$

$x = \pm 1$

REF: 012407aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

49 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

50 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: 082412aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

51 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

52 ANS: 4 REF: 012423aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

53 ANS: 3 REF: 062502aii NAT: S.IC.B.3 TOP: Analysis of Data

54 ANS: 4 REF: 062412aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, geometric

55 ANS: 2

$3x^2 - 4x + 2 = 2x - 3 \quad x = \dfrac{6 \pm \sqrt{(-6)^2 - 4(3)(5)}}{2(3)} = \dfrac{6 \pm \sqrt{-24}}{6} = \dfrac{6 \pm 2i\sqrt{6}}{6} = 1 \pm \dfrac{i\sqrt{6}}{3}$

$3x^2 - 6x + 5 = 0$

REF: 062410aii NAT: A.REI.B.4 TOP: Solving Quadratics

56 ANS: 3 REF: 062409aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

57 ANS: 2 REF: 012402aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

58 ANS: 1

$\dfrac{n}{m} = 2$

$n = 2m$

REF: 062515aii NAT: F.LE.A.4 TOP: Exponential Equations

59 ANS: 1

$2c\sqrt[3]{c} = 2c^{\frac{3}{3}} \cdot c^{\frac{1}{3}} = 2c^{\frac{4}{3}}$

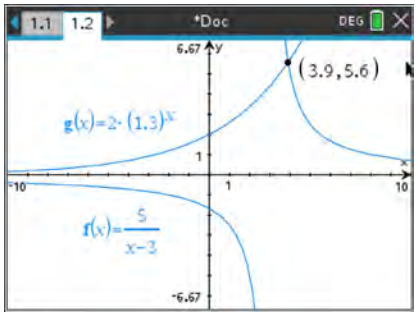
REF: 062501aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

60 ANS: 1

$$\begin{array}{r} 2x^2 + 4x + 3 \\ x+1 \overline{)\,2x^3 + 6x^2 + 7x + 2} \\ \underline{2x^3 + 2x^2} \\ \quad 4x^2 + 7x \\ \quad \underline{4x^2 + 4x} \\ \qquad 3x + 2 \\ \qquad \underline{3x + 3} \\ \qquad\quad -1 \end{array}$$

REF: 062508aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

61 ANS: 2



REF: 062402aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

62 ANS: 3

$$\left((1.026)^5\right)^{\frac{t}{5}} \approx 1.136938^{\frac{t}{5}}$$

REF: 062520aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

63 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: 012507aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

64 ANS: 4 REF: 082518aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, geometric

65 ANS: 2

$(x-1)^2 = 2x + 6$ -1 is extraneous.

$$x^2 - 2x + 1 = 2x + 6$$

$$x^2 - 4x - 5 = 0$$

$$(x-5)(x+1) = 0$$

$$x = 5, -1$$

REF: 082411aii NAT: A.REI.A.2 TOP: Solving Radicals

66 ANS: 1 REF: 012506aii NAT: S.IC.B.3 TOP: Analysis of Data

67 ANS: 3

$x^2 + 6x + 9 = -10 + 9$

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

$x + 3 = \pm i$

$x = -3 \pm i$

REF: 012416aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | completing the square

68 ANS: 1 REF: 082524aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

69 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

70 ANS: 3

$\sqrt{x} \bullet \sqrt[4]{x^{11}} = x^{\frac{1}{2}} \bullet x^{\frac{11}{4}} = x^{\frac{2}{4}} \bullet x^{\frac{11}{4}} = x^{\frac{13}{4}}$

REF: 012511aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

71 ANS: 4

$(2+4, -3+1)$

REF: 062518aii NAT: F.BF.B.3 TOP: Transformations with Functions

72 ANS: 4

$S_{10} = \frac{90000 - 90000(1.02)^{10}}{1 - 1.02} \approx 985,475$

REF: 082424aii NAT: F.BF.B.7 TOP: Series KEY: geometric

73 ANS: 4

$$\begin{array}{r|rrrr} -2 & 1 & 6 & 1 & -14 \\ & & -2 & -8 & 14 \\ \hline & 1 & 4 & -7 & 0 \end{array}$$

Since there is no remainder when the cubic is divided by $g + 2$, this binomial is a factor.

REF: 062512aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

74 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

75 ANS: 2

$\frac{12x^{8a}}{3x^{2a}}$

REF: 082502aii NAT: F.BF.A.1 TOP: Operations with Functions

76 ANS: 4

$S_5 = \frac{350 - 350(1.15)^5}{1 - 1.15} \approx 2360$

REF: 012524aii NAT: F.BF.B.7 TOP: Series KEY: geometric

77 ANS: 4

$\frac{x(x-4)}{(x+3)(x-4)} + \frac{2(x+3)}{(x-4)(x+3)} = \frac{2x+27}{(x-4)(x+3)}$ -3 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: 082405aii NAT: A.REI.A.2 TOP: Solving Rationals

78 ANS: 3 REF: 082401aii NAT: S.IC.B.3 TOP: Analysis of Data

79 ANS: 1 REF: 012405aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

80 ANS: 3

$9(e^{x-2}) = 36$

$\ln e^{x-2} = \ln 4$

$(x-2)\ln e = \ln 4$

$x = \ln 4 + 2$

REF: 082509aii NAT: F.LE.A.4 TOP: Exponential Equations

81 ANS: 4

Since the terminal side of θ 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

82 ANS: 4

$$2x-1\overline{)\,6x^3+7x^2-9x-1}$$

$$\begin{array}{r} 3x^2+5x-2 \\ 6x^3-3x^2 \\ \hline 10x^2-9x \\ 10x^2-5x \\ \hline -4x-1 \\ -4x+2 \\ \hline -3 \end{array}$$

REF: 082512aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

83 ANS: 2

$$y = \sqrt[3]{x} + 4$$

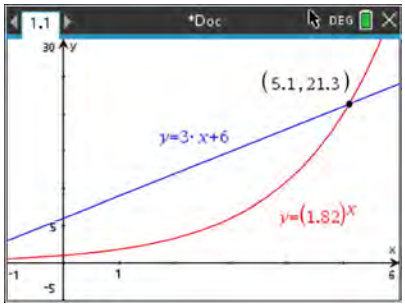
$$x = \sqrt[3]{y} + 4$$

$$x - 4 = \sqrt[3]{y}$$

$$(x-4)^3 = y$$

REF: 012519aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

84 ANS: 3



REF: 012406aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

85 ANS: 3

$y = 40(1.2)^8 \approx 168$

REF: 062406aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

86 ANS: 3

$3 \mid 1 \; 1 \; -3 \quad 9 \quad -108$

$\underline{\mid \quad 3 \quad 12 \quad 27 \quad 108}$

$1 \; 4 \quad 9 \quad 36 \quad 0$

$x^3 + 4x^2 + 9x + 36 = 0$

$x^2(x+4) + 9(x+4) = 0$

$(x^2 + 9)(x+4) = 0$

$x = \pm 3i, -4$

REF: 062420aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

87 ANS: 4 REF: 062411aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

88 ANS: 3

$\left(x^2 - 49\right)\left(\frac{7}{x+7} + \frac{4x}{x-7} = \frac{3x+7}{x-7}\right)$

$7(x-7) + 4x(x+7) = (3x+7)(x+7)$

$7x - 49 + 4x^2 + 28x = 3x^2 + 21x + 7x + 49$

$4x^2 + 35x - 49 = 3x^2 + 28x + 49$

$x^2 + 7x - 98 = 0$

$(x+14)(x-7) = 0$

$x = -14, 7$

REF: 012422aii NAT: A.REI.A.2 TOP: Solving Rationals

89 ANS: 2

$x^2 + (x-6)^2 = 20$

$x^2 + x^2 - 12x + 36 = 20$

$2x^2 - 12x + 16 = 0$

$x^2 - 6x + 8 = 0$

$(x-4)(x-2) = 0$

$y = 4 - 6 = -2$

REF: 082516aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

90 ANS: 2 REF: 082511aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

91 ANS: 4

$F = 325 - 185e^{-0.4(0)} = 325 - 185 = 140$

REF: 012415aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

92 ANS: 1

$1 + \frac{0.027}{12} = 1.00225$

REF: 082403aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

93 ANS: 1

$\cos\theta = -\frac{3}{5};\ \sec\theta = -\frac{5}{3}$

REF: 012421aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

94 ANS: 4

I. Minimum does not change, only period; II. $-16 + 8 = -8$; III. $\frac{1}{2}(-16) = -8$

REF: 012523aii NAT: F.BF.B.3 TOP: Transformations with Functions

95 ANS: 2

$$x-3\overline{)\,2x^4+0x^3-5x^2+3x-2}\quad 2x^3+6x^2+13x+42$$

$$\underline{2x^4-6x^3}$$
$$6x^3-5x^2$$
$$\underline{6x^3-18x^2}$$
$$13x^2+3x$$
$$\underline{13x^2-39x}$$
$$42x-2$$
$$\underline{42x-126}$$
$$124$$

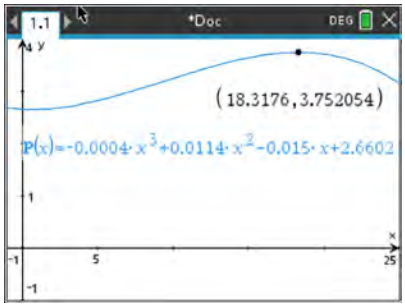
REF: 012408aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

96 ANS: 3

$2.12 \pm 2(.05)$

REF: 012509aii NAT: S.ID.A.4 TOP: Normal Distributions

97 ANS: 2



REF: 012414aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

98 ANS: 2

$$5(2)^{19x} = 50$$

$$\log_2 2^{19x} = \log_2 10$$

$$19x = \log_2 10$$

$$x = \frac{\log_2 10}{19}$$

REF: 062503aii NAT: F.LE.A.4 TOP: Exponential Equations

99 ANS: 2 REF: 082513aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

100 ANS: 1

$$\frac{-\frac{1}{8}a}{-\frac{1}{4}a} = \frac{-\frac{1}{16}a}{-\frac{1}{8}a} = \frac{1}{2}$$

REF: 062507aii NAT: F.IF.A.3 TOP: Sequences KEY: difference or ratio

101 ANS: 3 REF: 012508aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

102 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

103 ANS: 2

$y = x^3 - 3$

$x = y^3 - 3$

$x + 3 = y^3$

$\sqrt[3]{x+3} = y$

REF: 012419aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

104 ANS: 2

3	1	-1	-21	45	0
		3	6	-45	0
	1	2	-15	0	0

$x^3 + 2x^2 - 15x = 0$

$x(x^2 + 2x - 15) = 0$

$x(x+5)(x-3) = 0$

$x = 0, -5, 3$

REF: 012403aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

105 ANS: 2

$x + 1 = \sqrt{4x + 25}$ $-4 + 1 < 0$

$x^2 + 2x + 1 = 4x + 25$

$x^2 - 2x - 24 = 0$

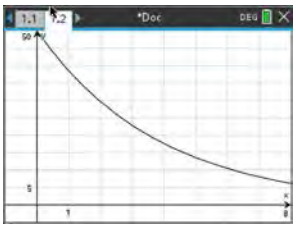
$(x-6)(x+4) = 0$

$x = 6, -4$

REF: 062408aii NAT: A.REI.A.2 TOP: Solving Radicals

106 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: 012516aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

107 ANS: 1

$$x-3\overline{)\,2x^3-3x^2-5x-12}\qquad 2x^2+3x+4$$

$$\underline{2x^3-6x^2}$$
$$3x^2-5x$$
$$\underline{3x^2-9x}$$
$$4x-12$$
$$\underline{4x-12}$$
$$0$$

REF: 012505aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

108 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: 012412aii NAT: F.BF.A.1 TOP: Operations with Functions

109 ANS: 2

$$V(x)=x(18-2x)(18-2x)=x(324-72x+4x^2)=324x-72x^2+4x^3$$

REF: 082418aii NAT: F.BF.A.1 TOP: Operations with Functions

110 ANS: 2

$u=x+3 \qquad u^2+4u-5$

$$(u+5)(u-1)$$
$$(x+3+5)(x+3-1)$$
$$(x+8)(x+2)$$

REF: 062401aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

111 ANS: 1

$$8^{\frac{x}{2}}\bullet 8^{\frac{x}{3}}=8^{\frac{5x}{6}}=\sqrt[6]{8^{5x}}$$

REF: 082419aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

112 ANS: 3 REF: 062513aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, geometric

113 ANS: 1

REF: 082507aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

114 ANS: 4

$$S_{15} = \frac{10 - 10(1.09)^{15}}{1 - 1.09} \approx 293.609$$

REF: 062424aii NAT: F.BF.B.7 TOP: Series KEY: geometric

115 ANS: 2

$9.82 \pm 2(1.4)$

REF: 012411aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

116 ANS: 2

$$\frac{17 + 60 - 7}{100} = \frac{70}{100}$$

REF: 082517aii NAT: S.CP.A.4 TOP: Conditional Probability

117 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

118 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: 062413aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

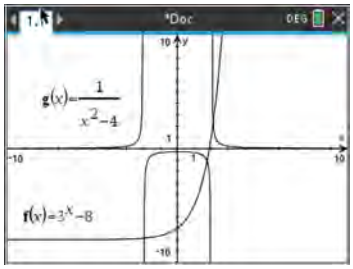
119 ANS: 2 REF: 082409aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

120 ANS: 1

$$\frac{x^2 + 3xy - 28y^2}{16y^2 - x^2} = \frac{(x + 7y)(x - 4y)}{(4y + x)(4y - x)} = \frac{-(x + 7y)}{4y + x} = \frac{-x - 7y}{x + 4y}$$

REF: 062523aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

121 ANS: 3



REF: 062511aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

122 ANS: 2 REF: 062505aii NAT: S.IC.B.4 TOP: Analysis of Data

123 ANS: 1

x-intercept: $f(x) = (x-2)^2(x+3) = 0$, $g(x) = 0$ at $x = 2, -3$;

$x = 2, -3$

y-intercept: $f(0) = (x-2)^2(x+3) = (0-2)^2(0+3) = 12$, $g(0) = -6$

REF: 062510aii NAT: F.IF.C.9 TOP: Comparing Functions

124 ANS: 1

II. The mass of the substance doubles every 20 years; III. $E(3 \cdot 60) = 26(2)^{\frac{180}{20}} \approx 13312$

REF: 082520aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

125 ANS: 2

$N(t) = 2(1.0098^{\frac{1}{60}})^{60t} \approx 2(1.000163)^{60t}$

REF: 082522aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

126 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: 012517aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

127 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

128 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: 082423aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

129 ANS: 4 REF: 082515aii NAT: F.BF.B.3 TOP: Transformations with Functions

130 ANS: 2

$i^2(5x - 2i)^2 = -(25x^2 - 20xi - 4)$

REF: 012512aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

131 ANS: 3

$r = \dfrac{-2\sqrt{3}}{\sqrt{6}} = \dfrac{-2}{\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{-2\sqrt{2}}{2} = -\sqrt{2}$ $a_7 = \sqrt{6}(-\sqrt{2})^{7-1} = \sqrt{6}(-\sqrt{2})^6 = \sqrt{6} \cdot 2^3 = 8\sqrt{6}$

REF: 012410aii NAT: F.BF.A.2 TOP: Sequences KEY: explicit

132 ANS: 4 REF: 012014aii NAT: S.IC.A.2 TOP: Analysis of Data

Algebra II Multiple Choice Regents Exam Questions
Answer Section

133 ANS: 4

$$\frac{13}{13+11} = \frac{13}{24}$$

REF: 012011aii NAT: S.CP.A.4 TOP: Conditional Probability

134 ANS: 2

$.43 \pm 2(0.05)$ contains about 95% of the data.

REF: 062317aii NAT: S.IC.B.4 TOP: Analysis of Data

135 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: 082208aii NAT: A.REI.B.4 TOP: Complex Conjugate Root Theorem

136 ANS: 4

1) $d(2) = 2$; 2) $d(1) = 12$; 3) $d(9) \approx 11$; 4) $d(-1) = 2$

REF: 062220aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

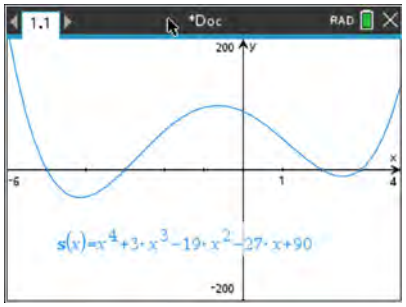
137 ANS: 1

$\frac{(x+3)(x+2)}{(x-5)(x+2)} + \frac{6(x-5)}{(x+2)(x-5)} = \frac{6+10x}{(x-5)(x+2)}$ 5 is extraneous.

$$x^2 + 5x + 6 + 6x - 30 = 10x + 6$$
$$x^2 + x - 30 = 0$$
$$(x+6)(x-5) = 0$$
$$x = -6, 5$$

REF: 062319aii NAT: A.REI.A.2 TOP: Solving Rationals

138 ANS: 4



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

$= x^2(x^2 - 9) + 3x(x^2 - 9) - 10(x^2 - 9)$

$= (x^2 + 3x - 10)(x^2 - 9)$

$= (x + 5)(x - 2)(x + 3)(x - 3)$

REF: 062303aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

139 ANS: 4 REF: 012014aii NAT: S.IC.A.2 TOP: Analysis of Data

140 ANS: 2

$x^2 = 3x + 40$. $x = -5$ is an extraneous solution.

$x^2 - 3x - 40 = 0$

$(x - 8)(x + 5) = 0$

$x = 8, -5$

REF: 012010aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

141 ANS: 3 REF: 082214aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

142 ANS: 4

Translate the parent log function 2 to the right and reflect over the *x*-axis.

REF: 082207aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

143 ANS: 1

$\frac{20}{14 + 20 + 6} = \frac{1}{2}$

REF: 082303aii NAT: S.CP.A.4 TOP: Conditional Probability

144 ANS: 4

$g(x)$: $\frac{10 - 6}{4 - 2} = 2$ $t(x)$: $\frac{3 - -5}{4 - 2} = 4$

REF: 062212aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: graph | table

145 ANS: 3

$x = 12y - 4$

$x + 4 = 12y$

$\frac{x+4}{12} = y$

REF: 082304aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

146 ANS: 2

$p(x) = 4^x$, $q(x) = \left(\frac{5}{9}\right)^x$, $r(x) = 5.29^x$, $s(x) = 2^x$

REF: 012304aii NAT: F.IF.C.8 TOP: Graphing Exponential Functions

147 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: 062301aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: table

148 ANS: 3

$\frac{4}{k^2 - 8k + 12} = \frac{k(k-6) + (k-2)}{k^2 - 8k + 12}$ $k = 6$ is extraneous

$4 = k^2 - 6k + k - 2$

$0 = k^2 - 5k - 6$

$0 = (k-6)(k+1)$

$k = 6, -1$

REF: 082218aii NAT: A.REI.A.2 TOP: Solving Rationals

149 ANS: 4 REF: 082205aii NAT: F.TF.A.2 TOP: Unit Circle

150 ANS: 3 REF: 012015aii NAT: S.IC.B.3 TOP: Analysis of Data

151 ANS: 1 REF: 062308aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

152 ANS: 3

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

$2x = y + 4$

$y = 2x - 4$

REF: 012315aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

153 ANS: 2

$a\sqrt[5]{a^4} = a^{\frac{5}{5}} \cdot a^{\frac{4}{5}} = a^{\frac{9}{5}}$

REF: 062306aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

154 ANS: 3 REF: 012002aii NAT: F.BF.A.1 TOP: Operations with Functions

155 ANS: 2

1) $x \to \infty, f(x) \to \infty$; 3) quartic polynomial; 4) three real roots

REF: 012318aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

156 ANS: 1 REF: 082309aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

157 ANS: 2

$(x^2+3)^2 - 2(x^2+3) - 24$ 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

158 ANS: 3

$95.4x - 6x^2 - (0.18x^3 + 0.02x^2 + 4x + 180)$

REF: 082322aii NAT: F.BF.A.1 TOP: Operations with Functions

159 ANS: 2

$\sqrt{(-2)^2 + (-3)^2} = \sqrt{13}$; $\tan\theta = \dfrac{\sin\theta}{\cos\theta} = \dfrac{\frac{-3}{\sqrt{13}}}{\frac{-2}{\sqrt{13}}} = \dfrac{3}{2}$

REF: 062304aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: extension to reals

160 ANS: 2

$\dfrac{x^2+12}{x^2+3} = \dfrac{x^2+3}{x^2+3} + \dfrac{9}{x^2+3} = 1 + \dfrac{9}{x^2+3}$

REF: 062218aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: addition and subtraction

161 ANS: 4

$\dfrac{x^2+6}{x^2+4} = \dfrac{x^2+4}{x^2+4} + \dfrac{2}{x^2+4} = 1 + \dfrac{2}{x^2+4}$

REF: 082321aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: addition and subtraction

162 ANS: 4 REF: 062309aii NAT: F.IF.C.9 TOP: Comparing Functions

163 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: 062217aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

164 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: 012022aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

165 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: 082223aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

166 ANS: 3

$\sqrt{3x + 18} = x$ –3 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

167 ANS: 2

$1 = \frac{2\pi}{k}$

$k = 2\pi$

REF: 012313aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

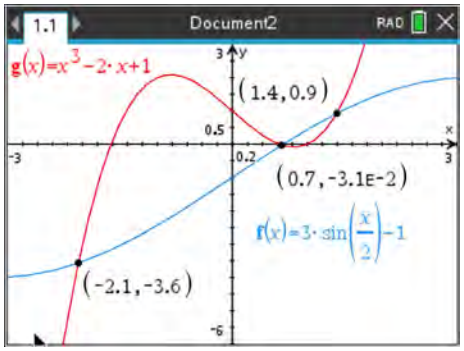
168 ANS: 2 REF: 082222aii NAT: A.CED.A.1 TOP: Modeling Rationals

169 ANS: 2

$.962^{10} \approx .679$

REF: 082311aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

170 ANS: 2



REF: 012021aii NAT: A.REI.D.11 TOP: Other Systems
KEY: trigonometric

171 ANS: 2

$$\begin{array}{r} 2x^2 - 3x + 5 \\ x+3\overline{)\,2x^3 + 3x^2 - 4x + 5} \\ \underline{2x^3 + 6x^2} \\ -3x^2 - 4x \\ \underline{-3x^2 - 9x} \\ 5x + 5 \\ \underline{5x + 15} \\ -10 \end{array}$$

REF: 082302aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

172 ANS: 3 REF: 062205aii NAT: F.BF.B.3 TOP: Transformations with Functions

173 ANS: 1

$x^2 - 4x + 4 = -13 + 4$

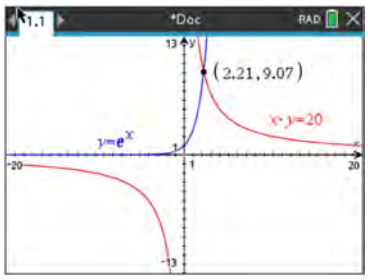
$(x-2)^2 = -9$

$x - 2 = \pm 3i$

$x = 2 \pm 3i$

REF: 062312aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | completing the square

174 ANS: 1



REF: 082210aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

175 ANS: 2

$40 - (20 + 22 - 15) = 13$

REF: 062204aii NAT: S.CP.B.7 TOP: Addition Rule

176 ANS: 2 REF: 082203aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: amplitude

177 ANS: 4 REF: 082318aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

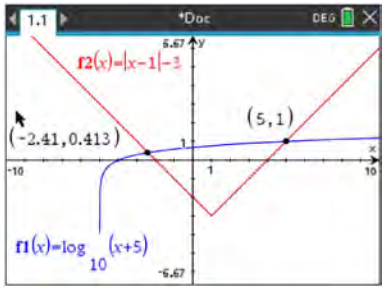
178 ANS: 4 REF: 082220aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

179 ANS: 3

$x^2 - 6x + 9 - \left(x^2 + 6x + 9\right) = -12x$

REF: 062210aii NAT: F.BF.A.1 TOP: Operations with Functions

180 ANS: 3



REF: 012317aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

181 ANS: 1

$\frac{N(6) - N(0)}{6 - 0} \approx -8.93$

REF: 012012aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

182 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

183 ANS: 1 REF: 082221aii NAT: F.BF.B.6 TOP: Sigma Notation
KEY: represent

184 ANS: 3

$\frac{x+2}{x} + \frac{x}{3} = \frac{2x^2+6}{3x}$ 0 is extraneous.

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

$$x^2+3x+6 = 2x^2+6$$

$$x^2-3x = 0$$

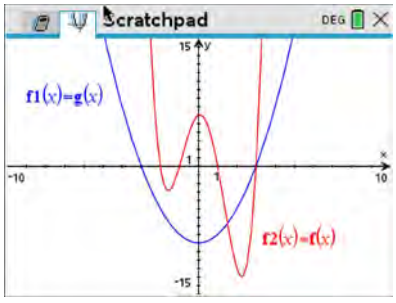
$$x(x-3) = 0$$

$$x = 0, 3$$

REF: 012309aii NAT: A.REI.A.2 TOP: Solving Rationals

185 ANS: 3 REF: 082201aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

186 ANS: 2



REF: 082319aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

187 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: $9-k^2=0$ $k=\pm 3$

Set imaginary part equal to imaginary part: $-12ki=-36i$

$\frac{-12ki}{-12i}=\frac{-36i}{-12i}$

$k=3$

REF: 012308aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

188 ANS: 2

$$x-2\overline{)\,x^3-0x^2+0x-2}\qquad x^2+2x+4$$

$\underline{x^3-2x^2}$

$2x^2+0x$

$\underline{2x^2-4x}$

$4x-2$

$\underline{4x-8}$

6

REF: 082217aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

189 ANS: 4

$45\%+31\%-58\%=18\%$

REF: 082307aii NAT: S.CP.B.7 TOP: Addition Rule

190 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: 012307aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

191 ANS: 3

$a=105, 0<b<1$

REF: 082314aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

192 ANS: 1

$\left(a\sqrt[3]{2b^2}\right)\left(\sqrt[3]{4a^2b}\right) = a\sqrt[3]{8a^2b^3} = 2ab\sqrt[3]{a^2}$

REF: 082213aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

193 ANS: 4

$y = -(x-1)^2 + 5 \qquad 3 + y = 4$

$4 - x = -x^2 + 2x - 1 + 5 \qquad y = 1$

$x^2 - 3x = 0$

$x(x-3) = 0$

$x = 0, 3$

REF: 082305aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

194 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: 062321aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

195 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: 062221aii NAT: F.IF.A.3 TOP: Sequences KEY: recursive

196 ANS: 2 REF: 082204aii NAT: S.IC.B.3 TOP: Analysis of Data

197 ANS: 3 REF: 012005aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

198 ANS: 2

$f(x) = f(-x)$

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

$x^2 + 1 = x^2 + 1$

REF: 082323aii NAT: F.BF.B.3 TOP: Even and Odd Functions
KEY: graphically

199 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

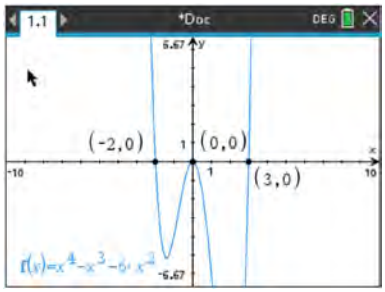
200 ANS: 1

$0.5^{\frac{1}{0.0803}} \approx 0.000178$

REF: 082224aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

201 ANS: 2 REF: 082324aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

202 ANS: 2



REF: 012316aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

203 ANS: 1

1) $A(20) > 0$; 2) $.5 \times .5 = .25$; 3) true; 4) $A(7) \approx 9.9$

REF: 082211aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

204 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

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: 062223aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

206 ANS: 1

-2	1	-1	-11	5	30
		-2	6	10	-30
	1	-3	-5	15	0

Since there is no remainder when the quartic is divided by $x + 2$, this binomial is a factor.

REF: 082320aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

207 ANS: 2 REF: 082313aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

208 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: 082209aii NAT: F.LE.A.4 TOP: Exponential Growth

209 ANS: 2 REF: 062206aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

210 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: 012312aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

211 ANS: 4

$2 \times 0.035 = 0.07$

REF: 012319aii NAT: S.IC.B.4 TOP: Analysis of Data

212 ANS: 2 REF: 062324aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

213 ANS: 4 REF: 012008aii NAT: S.CP.A.3 TOP: Conditional Probability

214 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: 012019aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

215 ANS: 4 REF: 012314aii NAT: S.IC.B.3 TOP: Analysis of Data

216 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: 082316aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

217 ANS: 2

$-23(1)+56=33;\ -23(-1)+56=79$

REF: 062305aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

218 ANS: 4
1) is a correct formula, but not recursive

REF: 082216aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

219 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: 012302aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

220 ANS: 3

between 000 and 449, inclusive $\rightarrow \frac{450}{1000} = 45\%$

REF: 012024aii NAT: S.IC.B.3 TOP: Analysis of Data

221 ANS: 2 REF: 082308aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

222 ANS: 4 REF: 082301aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

223 ANS: 1

$$\begin{array}{r} x^2 - 2x + 5 \\ 2x + 4 \overline{)\ 2x^3 + 0x^2 + 2x - 7} \\ \underline{2x^3 + 4x^2} \\ -4x^2 + 2x \\ \underline{-4x^2 - 8x} \\ 10x - 7 \\ \underline{10x + 20} \\ -27 \end{array}$$

REF: 062313aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

224 ANS: 2 REF: 062222aii NAT: F.IF.C.9 TOP: Comparing Functions

225 ANS: 2
1) 1 real, mult. 2; 3) not a quadratic; 4) not a function.

REF: 012324aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

226 ANS: 1

$$\frac{x(x^2-9)}{-(x^2-9)} = -x$$

REF: 012023aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

227 ANS: 3

$y = 1.77(1.18)^x \quad y(41) \approx 1,850,950$

REF: 062314aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

228 ANS: 4

REF: 062316aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

229 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

230 ANS: 4

$(x-2i)(x-2i) = x^2 - 4xi + 4i^2 = x^2 - 4xi - 4$

REF: 082202aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

231 ANS: 3

$$\frac{-2}{\sqrt{5^2 - 2^2}} = \frac{-2}{\sqrt{21}}$$

REF: 082312aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

232 ANS: 1 REF: 062318aii NAT: F.BF.B.3 TOP: Even and Odd Functions
KEY: graphically

233 ANS: 2 REF: 062219aii NAT: F.TF.A.1 TOP: Unit Circle

234 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: 012001aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

235 ANS: 2 REF: 012321aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, general

236 ANS: 1 REF: 062201aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

237 ANS: 2
The mass of the carbon-14 is decreasing by half every 5715 years.

REF: 062211aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

238 ANS: 1

$$\begin{array}{r} 2x^2 + x - 6 \\ x+3\overline{)\,2x^3 + 7x^2 - 3x - 25} \\ \underline{2x^3 + 6x^2} \\ x^2 - 3x \\ \underline{x^2 + 3x} \\ -6x - 25 \\ \underline{-6x - 18} \\ -7 \end{array}$$

REF: 062203aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

239 ANS: 1

$u = x + 2 \qquad u^2 - 5u + 6$

$(u-3)(u-2)$

$(x+2-3)(x+2-2)$

$(x-1)x$

REF: 012301aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

240 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: 062209aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

241 ANS: 4 REF: 012303aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

242 ANS: 4

I. $\left(\frac{y}{x^3}\right)^{-1} = \frac{x^3}{y}$; II. $\sqrt[3]{x^9}\,(y^{-1}) = \frac{x^{\frac{9}{3}}}{y} = \frac{x^3}{y}$; III. $\frac{x^6\sqrt[4]{y^8}}{x^3y^3} = \frac{x^3y^{\frac{8}{4}}}{y^3} = \frac{x^3}{y}$

REF: 062320aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

243 ANS: 4 REF: 062216aii NAT: S.IC.B.3 TOP: Analysis of Data

244 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: 082310aii NAT: F.IF.C.9 TOP: Comparing Functions

245 ANS: 1

$$\left(1.03^{\frac{1}{12}}\right)^{12t} \approx 1.00247^{12t}$$

REF: 062224aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

246 ANS: 4

(1) and (3) are not recursive

REF: 012013aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

247 ANS: 4 REF: 012016aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
KEY: increasing/decreasing

248 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: 082306aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

249 ANS: 3

$$x+2\overline{)\,2x^2+5x+8}\qquad 2x+1$$

$$\underline{2x^2+4x}$$

$$x+8$$

$$\underline{x+2}$$

$$6$$

REF: 012007aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

250 ANS: 3

$(x+a)^2+5(x+a)+4$ let $u=x+a$

u^2+5u+4

$(u+4)(u+1)$

$(x+a+4)(x+a+1)$

REF: 012006aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: multivariable

251 ANS: 4 REF: 062215aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

252 ANS: 3

$$S_{20}=\frac{-2-(-2)(-3)^{20}}{1-(-3)}=1,743,392,200$$

REF: 012306aii NAT: F.BF.B.7 TOP: Series KEY: geometric

253 ANS: 4

$\log 2^t=\log\sqrt{10}$ 2) $\dfrac{\log\sqrt{10}}{\log 2}=\log_2\sqrt{10}$, 1) $\log_2\sqrt{10}=\log_2 10^{\frac{1}{2}}=\dfrac{1}{2}\log_2 10$, 3) $\log_4 10=\dfrac{\log_2 10}{\log_2 4}=\dfrac{1}{2}\log_2 10$

$t\log 2=\log\sqrt{10}$

$$t=\frac{\log\sqrt{10}}{\log 2}$$

REF: 012009aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

254 ANS: 1

$$2000\left(1+\frac{.032}{12}\right)^{12t}\approx 2000(1.003)^{12t}$$

REF: 012004aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

255 ANS: 3 REF: 062302aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

256 ANS: 4

$\frac{1}{2}x^2 + 2x = \frac{1}{4}x - 8 \qquad b^2 - 4ac$

$2x^2 + 8x = x - 32 \qquad 7^2 - 4(2)(32) < 0$

$2x^2 + 7x + 32 = 0$

REF: 012310aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

257 ANS: 1

$1.0325^{\frac{1}{12}} \approx 1.0027$

REF: 012323aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

258 ANS: 3

$3i(ai - 6i^2) = 3ai^2 - 18i^3 = -3a + 18i$

REF: 062307aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

259 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: 082206aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

260 ANS: 2

$\frac{x^2 + 3x}{x^2 + 5x + 6} = \frac{x(x + 3)}{(x + 2)(x + 3)}$

REF: 082215aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

261 ANS: 3

$e^{\left(-\frac{3}{0.6}\right)} \approx 0.006738$

REF: 062315aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

262 ANS: 1 REF: 062214aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict

263 ANS: 1

$$x+2\overline{)\,x^4+0x^3-5x^2+4x+14}\qquad x^3-2x^2-x+6$$

$$\begin{array}{r} x^4+2x^3 \\ \hline -2x^3-5x^2 \\ -2x^3-4x^2 \\ \hline -x^2+4x \\ -x^2-2x \\ \hline 6x+14 \\ 6x+12 \\ \hline 2 \end{array}$$

REF: 012305aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

264 ANS: 1

$50(.9)^t = 25$

$t \approx 6.57$

REF: 082317aii NAT: F.LE.A.4 TOP: Exponential Decay

Algebra II Multiple Choice Regents Exam Questions
Answer Section

265 ANS: 3

$e^{bt} = \frac{c}{a}$

$\ln e^{bt} = \ln \frac{c}{a}$

$bt \ln e = \ln \frac{c}{a}$

$t = \frac{\ln \frac{c}{a}}{b}$

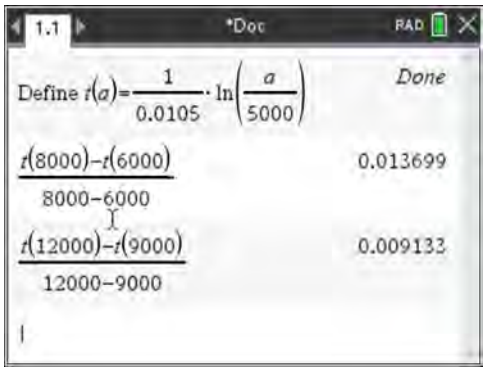
REF: 011813aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

266 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: 011921aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

267 ANS: 3



REF: 081922aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: logarithmic

268 ANS: 1

$x - \dfrac{4}{x-1} = 2 \qquad x = \dfrac{3 \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)} = \dfrac{3 \pm \sqrt{17}}{2}$

$x(x-1) - 4 = 2(x-1)$

$x^2 - x - 4 = 2x - 2$

$x^2 - 3x - 2 = 0$

REF: 011812aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

269 ANS: 2 REF: 011820aii NAT: S.IC.A.2 TOP: Analysis of Data

270 ANS: 4

$m^3 - 2m^2 + 4m - 8 = 0$

$m^2(m-2) + 4(m-2) = 0$

$\left(m^2 + 4\right)(m-2) = 0$

REF: 081821aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

271 ANS: 3

$\dfrac{2}{3x+1} = \dfrac{1}{x} - \dfrac{6x}{3x+1}$ $-\dfrac{1}{3}$ is extraneous.

$\dfrac{6x+2}{3x+1} = \dfrac{1}{x}$

$6x^2 + 2x = 3x + 1$

$6x^2 - x - 1 = 0$

$(2x-1)(3x+1) = 0$

$x = \dfrac{1}{2}, -\dfrac{1}{3}$

REF: 011915aii NAT: A.REI.A.2 TOP: Solving Rationals

272 ANS: 4

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

REF: 081921aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

273 ANS: 4

$p(5) = 2(5)^3 - 3(5) + 5 = 240$

REF: 011819aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

274 ANS: 2

$y = \frac{1}{2}x + 8 \quad x = \frac{1}{2}y + 8$

$2x = y + 16$

$y = 2x - 16$

REF: 081806aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

275 ANS: 3 REF: 081819aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

276 ANS: 2 REF: 011910aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

277 ANS: 3

$1^3 - k(1)^2 + 2(1) = 0$

$k = 3$

REF: 061812aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

278 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: 081907aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: addition and subtraction

279 ANS: 2 REF: 061917aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

280 ANS: 3 REF: 081909aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, geometric

281 ANS: 1

$-4(-1) - 3 = 1 \;\; 8 = \frac{2\pi}{b}$

$b = \frac{\pi}{4}$

REF: 081820aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

282 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: 061818aii NAT: F.LE.A.4 TOP: Exponential Decay

283 ANS: 3

$$\frac{x^2(x+2)-9(x+2)}{x\left(x^2-x-6\right)}=\frac{\left(x^2-9\right)(x+2)}{x(x-3)(x+2)}=\frac{(x+3)(x-3)}{x(x-3)}=\frac{x+3}{x}$$

REF: 061803aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

284 ANS: 4

$$1+\frac{.009}{12}=1.00075$$

REF: 011918aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

285 ANS: 2

$$x=-6(y-2)$$

$$-\frac{x}{6}=y-2$$

$$-\frac{x}{6}+2=y$$

REF: 011821aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

286 ANS: 4 REF: 081912aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: mixed

287 ANS: 2 REF: 081816aii NAT: F.BF.B.5 TOP: Inverse of Functions
KEY: exponential

288 ANS: 3

To determine student opinion, survey the widest range of students.

REF: 062202aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

289 ANS: 3 REF: 061824aii NAT: A.CED.A.1 TOP: Modeling Rationals

290 ANS: 4

There is no *x*-intercept.

REF: 011823aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

291 ANS: 4 REF: 011808aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

292 ANS: 1

$$(x^{\frac{3}{2}})^2=x^3$$

REF: 061908aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

293 ANS: 2

$n^2\left(n^2-9\right)+4n\left(n^2-9\right)-12\left(n^2-9\right)$

$\left(n^2+4n-12\right)\left(n^2-9\right)$

$(n+6)(n-2)(n+3)(n-3)$

REF: 061911aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

294 ANS: 1 REF: 011814aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

295 ANS: 3

$$\frac{x^{\frac{2}{3}} \bullet x^{\frac{5}{2}}}{x^{\frac{1}{6}}} = \frac{x^{\frac{4}{6}} \bullet x^{\frac{15}{6}}}{x^{\frac{1}{6}}} = x^{\frac{18}{6}} = x^3$$

REF: 081812aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

296 ANS: 2 REF: 081802aii NAT: S.IC.B.3 TOP: Analysis of Data

297 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: 011802aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

298 ANS: 4

$400 \cdot .954 \approx 380$

REF: 061918aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict

299 ANS: 1

$$3x+1\overline{)\,9x^2+0x-2}\qquad 3x-1$$

$$\underline{9x^2+3x}$$
$$-3x-2$$
$$\underline{-3x-1}$$
$$-1$$

REF: 081910aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

300 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: 081811aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

301 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: 081913aii NAT: S.CP.A.3 TOP: Conditional Probability

302 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

303 ANS: 4 REF: 011805aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

304 ANS: 3

$440\times 2.3\%\approx 10$

REF: 011807aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict

305 ANS: 3 REF: 011917aii NAT: F.BF.B.5 TOP: Inverse of Functions
KEY: exponential

306 ANS: 4

$$\frac{2}{x} = \frac{4x}{x+3}$$

$$2x + 6 = 4x^2$$

$$4x^2 - 2x - 6 = 0$$

$$2\left(2x^2 - x - 3\right) = 0$$

$$(2x - 3)(x + 1) = 0$$

$$x = \frac{3}{2}, -1$$

REF: 061809aii NAT: A.REI.A.2 TOP: Solving Rationals

307 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) $\frac{(x+7)(x+1)(x+3)}{(x+3)} = (x+7)(x+1)$

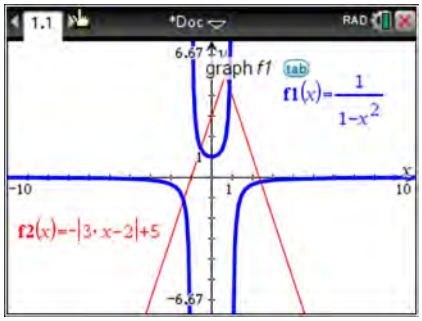
REF: 061808aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

308 ANS: 3

$1.04^{\frac{1}{12}} \approx 1.0032737$

REF: 011906aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

309 ANS: 4



REF: 011924aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

310 ANS: 4

$5000\left(1+\frac{.035}{12}\right)^{12\cdot 6} \approx 6166.50$

REF: 081917aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

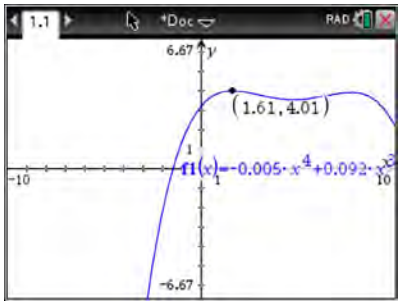
311 ANS: 4

(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: 011909aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

312 ANS: 4 REF: 081803aii NAT: F.BF.A.1 TOP: Operations with Functions

313 ANS: 3



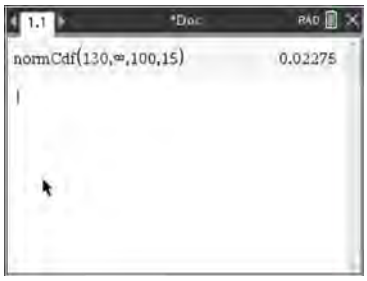
REF: 011817aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

314 ANS: 2

$P = \frac{2\pi}{\frac{\pi}{45}} = 90$

REF: 081822aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

315 ANS: 1



REF: 081919aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

316 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: 011903aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

317 ANS: 1

$1240(1.06)^x = 890(1.11)^x$

$x \approx 7$

REF: 061814aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

318 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: 061813aii NAT: F.BF.A.1 TOP: Operations with Functions

319 ANS: 1 REF: 081903aii NAT: F.LE.A.2 TOP: Families of Functions

320 ANS: 3

$8r^3 = 216 \quad S_{12} = \dfrac{8 - 8(3)^{12}}{1 - 3} = 2125760$

$r^3 = 27$

$r = 3$

REF: 081902aii NAT: F.BF.B.7 TOP: Series KEY: geometric

321 ANS: 3 REF: 061901aii NAT: S.IC.B.3 TOP: Analysis of Data

322 ANS: 3 REF: 061910aii NAT: F.IF.A.3 TOP: Sequences
KEY: difference or ratio

323 ANS: 3

$-3 + 5i - \left(4 + 24i - 2i - 12i^2\right) = -3 + 5i - (16 + 22i) = -19 - 17i$

REF: 081815aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

324 ANS: 2

$0.254 \pm 2(0.060) \rightarrow (0.134, 0.374)$

REF: 061913aii NAT: S.IC.B.4 TOP: Analysis of Data

325 ANS: 2

$\dfrac{85}{210 + 85}$

REF: 081818aii NAT: S.CP.A.3 TOP: Conditional Probability

326 ANS: 4 REF: 081810aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, geometric

327 ANS: 4

$$(x^6y^4 - 9)(x^4 - 16)$$

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

REF: 081814aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

328 ANS: 4

$$a = \frac{14-4}{2} = 5,\ d = \frac{14+4}{2} = 9$$

REF: 061810aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

329 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: 061903aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

330 ANS: 2 REF: 081908aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

331 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

332 ANS: 4

$$\log_2(x-1) - 1 = 0$$

$$\log_2(x-1) = 1$$

$$x - 1 = 2^1$$

$$x = 3$$

REF: 061819aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

333 ANS: 3 REF: 011824aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, arithmetic

334 ANS: 4
1 year = 365 days

REF: 061823aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions
335 ANS: 1 REF: 081804aii NAT: F.IF.C.9 TOP: Comparing Functions
336 ANS: 4 REF: 011801aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias
337 ANS: 3

$$x+6\overline{)\,2x^4+8x^3-25x^2-6x+14}\qquad 2x^3-4x^2-x+\frac{14}{x+6}$$

$$\underline{2x^4+12x^3}$$
$$-4x^3-25x^2$$
$$\underline{-4x^3-24x^2}$$
$$-x^2-6x$$
$$\underline{-x^2-6x}$$

REF: 081805aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division
338 ANS: 2

$$4x \bullet x^{\frac{2}{3}} + 2x^{\frac{5}{3}} = 4x^{\frac{5}{3}} + 2x^{\frac{5}{3}} = 6x^{\frac{5}{3}} = 6\sqrt[3]{x^5}$$

REF: 061820aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
339 ANS: 4 REF: 081906aii NAT: S.IC.B.3 TOP: Analysis of Data
340 ANS: 2 REF: 011804aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
341 ANS: 3

$$T(19) = 8\sin(0.3(19) - 3) + 74 \approx 77$$

REF: 061922aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
342 ANS: 2

$$x^2 + 4x - 1 = x - 3 \qquad y + 3 = -1$$
$$x^2 + 3x + 2 = 0 \qquad y = -4$$
$$(x+2)(x+1) = 0$$
$$x = -2, -1$$

REF: 061801aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems
343 ANS: 2 REF: 061802aii NAT: F.IF.C.8 TOP: Graphing Exponential Functions

344 ANS: 1

$$x - \frac{20}{x} = 8$$

$$x^2 - 8x - 20 = 0$$

$$(x - 10)(x + 2) = 0$$

$$x = 10, -2$$

REF: 061916aii NAT: A.CED.A.1 TOP: Modeling Rationals

345 ANS: 2

$1.00643^{12} \approx 1.08$

REF: 081808aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

346 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: 011818aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

347 ANS: 1 REF: 011815aii NAT: F.TF.A.2 TOP: Unit Circle

348 ANS: 2

$f(x) = f(-x)$

$x^2 - 4 = (-x)^2 - 4$

$x^2 - 4 = x^2 - 4$

REF: 061806aii NAT: F.BF.B.3 TOP: Even and Odd Functions
KEY: graphically

349 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: 081809aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

350 ANS: 2

$b^2 = 2b^2 - 64$ -8 is extraneous.

$-b^2 = -64$

$b = \pm 8$

REF: 061919aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

351 ANS: 4 REF: 081824aii NAT: S.CP.A.3 TOP: Conditional Probability

352 ANS: 4 REF: 061907aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

353 ANS: 4

$\ln e^{0.3x} = \ln \frac{5918}{87}$

$x = \frac{\ln \frac{5918}{87}}{0.3}$

REF: 081801aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

354 ANS: 4 REF: 061921aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

355 ANS: 4

The maximum of p is 5. The minimum of f is $-\frac{21}{4}$ ($x = \frac{-6}{2(4)} = -\frac{3}{4}$

$f\left(-\frac{3}{4}\right) = 4\left(-\frac{3}{4}\right)^2 + 6\left(-\frac{3}{4}\right) - 3 = 4\left(\frac{9}{16}\right) - \frac{18}{4} - \frac{12}{4} = -\frac{21}{4}$). $\frac{20}{4} - \left(-\frac{21}{4}\right) = \frac{41}{4} = 10.25$

REF: 011922aii NAT: F.IF.C.9 TOP: Comparing Functions

356 ANS: 1

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

REF: 011919aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

357 ANS: 2

$S_{20} = \frac{.01 - .01(3)^{20}}{1-3} = 17,433,922$

REF: 011822aii NAT: F.BF.B.7 TOP: Series KEY: geometric

358 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: 081807aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

359 ANS: 1

$6 - (3x - 2i)(3x - 2i) = 6 - \left(9x^2 - 12xi + 4i^2\right) = 6 - 9x^2 + 12xi + 4 = -9x^2 + 12xi + 10$

REF: 061915aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

360 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

361 ANS: 3
$(x+3i)^2-(2x-3i)^2=x^2+6xi+9i^2-\left(4x^2-12xi+9i^2\right)=-3x^2+18xi$

REF: 061805aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

362 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: 081918aii NAT: F.LE.A.4 TOP: Exponential Decay

363 ANS: 2
$121(b)^2=64 \quad 64\left(\frac{8}{11}\right)^2\approx 34$

$b=\frac{8}{11}$

REF: 011904aii NAT: F.BF.A.2 TOP: Sequences KEY: explicit

364 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: 061807aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

365 ANS: 2

REF: 061817aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: probability

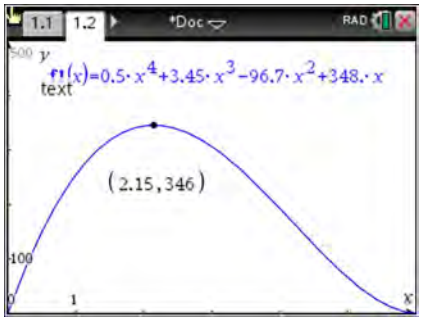
366 ANS: 2 REF: 061816aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions
KEY: bimodalgraph

367 ANS: 1

$84.1\% \times 750 \approx 631$

REF: 011923aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict

368 ANS: 1



REF: 011908aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

369 ANS: 3

$x^2 + (2x)^2 = 5 \quad y = 2x = \pm 2$

$x^2 + 4x^2 = 5$

$5x^2 = 5$

$x = \pm 1$

REF: 081916aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

370 ANS: 4

$\sqrt{3x^2y} \bullet \sqrt[3]{27x^3y^2} = 3^{\frac{1}{2}} xy^{\frac{1}{2}} \bullet 3^{\frac{2}{2}} xy^{\frac{2}{3}} = 3^{\frac{3}{2}} x^2 y^{\frac{7}{6}}$

REF: 081914aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

371 ANS: 2 REF: 081911aii NAT: F.BF.B.3 TOP: Even and Odd Functions
KEY: graphically

372 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: 011913aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

373 ANS: 4

$$\begin{array}{r} 5x^2 + x - 3 \\ 2x - 1 \overline{)\ 10x^3 - 3x^2 - 7x + 3} \\ \underline{10x^3 - 5x^2} \\ 2x^2 - 7x \\ \underline{2x^2 - x} \\ -6x + 3 \\ \underline{-6x + 3} \end{array}$$

REF: 011809aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

374 ANS: 4

$wx^2 + w = 0$

$w(x^2 + 1) = 0$

$x^2 = -1$

$x = \pm i$

REF: 061912aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | taking square roots

375 ANS: 1 REF: 081813aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

376 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: 081905aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

377 ANS: 2

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

$$xy + 2x = y$$

$$xy - y = -2x$$

$$y(x-1) = -2x$$

$$y = \frac{-2x}{x-1}$$

REF: 081924aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: rational

378 ANS: 2 REF: 011901aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: mean and standard deviation

379 ANS: 2 REF: 061804aii NAT: S.ID.B.6 TOP: Regression
KEY: choose model

380 ANS: 1

$$9110 = 5000e^{30r}$$

$$\ln\frac{911}{500} = \ln e^{30r}$$

$$\frac{\ln\frac{911}{500}}{30} = r$$

$$r \approx .02$$

REF: 011810aii NAT: F.LE.A.4 TOP: Exponential Growth

381 ANS: 2 REF: 081904aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

382 ANS: 4 REF: 061914aii NAT: A.REI.D.11 TOP: Other Systems
KEY: table

383 ANS: 4

$x(x-2)\left(\frac{10}{x^2-2x} + \frac{4}{x} = \frac{5}{x-2}\right)$ 2 is extraneous.

$$10 + 4(x-2) = 5x$$

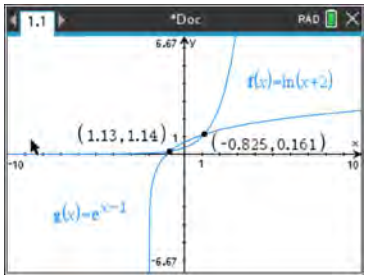
$$10 + 4x - 8 = 5x$$

$$2 = x$$

REF: 081915aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

384 ANS: 4 REF: 081817aii NAT: F.BF.B.3 TOP: Transformations with Functions

385 ANS: 2



REF: 081920aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

386 ANS: 1 REF: 011902aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

387 ANS: 4

$$S_7 = \frac{85000 - 85000(1.06)^7}{1 - 1.06} \approx 713476.20$$

REF: 061905aii NAT: F.BF.B.7 TOP: Series KEY: geometric

388 ANS: 3

$y = x^3 - 2$

$x = y^3 - 2$

$x + 2 = y^3$

$\sqrt[3]{x+2} = y$

REF: 061815aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

389 ANS: 1

2) linear, 3) quadratic, 4) cubic

REF: 061920aii NAT: F.LE.A.2 TOP: Families of Functions

390 ANS: 2

$u = x + 2 \qquad u^2 + 4u + 3$

$(u + 3)(u + 1)$

$(x + 2 + 3)(x + 2 + 1)$

$(x + 5)(x + 3)$

REF: 081901aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

391 ANS: 1

$1.025^{\frac{1}{12}} \approx 1.00206$

REF: 081924aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

392 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

393 ANS: 3 REF: 061906aii NAT: F.LE.A.2 TOP: Families of Functions

394 ANS: 3

$$y = 278(0.5)^{\frac{18}{1.8}} \approx 0.271$$

REF: 011920aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

395 ANS: 1 REF: 061904aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: graph

396 ANS: 2

$x = 4y + 5$

$x - 5 = 4y$

$\frac{1}{4}x - \frac{5}{4} = y$

REF: 061909aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

397 ANS: 4

$0.48 \cdot 0.25 = 0.12$

REF: 061811aii NAT: S.CP.A.2 TOP: Probability of Compound Events

398 ANS: 4

$a_1 = 2.5 + 0.5(1) = 3$

REF: 011916aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, arithmetic

Algebra II Multiple Choice Regents Exam Questions
Answer Section

399 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: 081615aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

400 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

401 ANS: 2 REF: 081610aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
KEY: increasing/decreasing

402 ANS: 1 REF: 081609aii NAT: F.BF.B.6 TOP: Sigma Notation
KEY: represent

403 ANS: 1 REF: 061701aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

404 ANS: 1 REF: 011704aii NAT: F.TF.C.8 TOP: Proving Trigonometric Identities
KEY: basic

405 ANS: 1

$8(2^{x+3}) = 48$

$2^{x+3} = 6$

$(x+3)\ln 2 = \ln 6$

$x + 3 = \frac{\ln 6}{\ln 2}$

$x = \frac{\ln 6}{\ln 2} - 3$

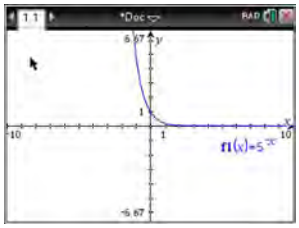
REF: 061702aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

406 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

407 ANS: 4



$y = 5^{-t} = \left(\frac{1}{5}\right)^t$

REF: 061615aii NAT: F.IF.C.8 TOP: Graphing Exponential Functions

408 ANS: 4 REF: 081624aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, geometric

409 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

410 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: 061608aii NAT: F.BF.A.1 TOP: Operations with Functions

411 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

412 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: 081714aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: rational

413 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
KEY: graphically

414 ANS: 1 REF: 061708aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

415 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

416 ANS: 2 REF: 061620aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

417 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

418 ANS: 2

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

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

$$-x + 8 = 2\sqrt{2x+5}$$

$$x^2 - 16x + 64 = 8x + 20$$

$$x^2 - 24x + 44 = 0$$

$$(x-22)(x-2) = 0$$

$$x = 2, 22$$

$$\sqrt{22+14} - \sqrt{2(22)+5} = 1$$

$$6 - 7 \neq 1$$

REF: 081704aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: advanced

419 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

420 ANS: 1

2	1	0	-4	-4	8
		2	4	0	-8
	1	2	0	-4	0

Since there is no remainder when the quartic is divided by $x - 2$, this binomial is a factor.

REF: 061711aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

421 ANS: 4 REF: 061716aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

422 ANS: 3 REF: 081618aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, geometric

423 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: 011912aii NAT: S.CP.A.2 TOP: Probability of Compound Events

424 ANS: 3

$$d = 10 \log \frac{6.3 \times 10^{-3}}{1.0 \times 10^{-12}} \approx 98$$

REF: 011715aii NAT: F.IF.B.4 TOP: Evaluating Logarithmic Expressions

425 ANS: 1

$$\frac{A}{P} = e^{rt}$$

$$0.42 = e^{rt}$$

$$\ln 0.42 = \ln e^{rt}$$

$$-0.87 \approx rt$$

REF: 011723aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

426 ANS: 2
The 2010 population is 110 million.

REF: 061718aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

427 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

428 ANS: 1

$$2x-1\overline{)\,4x^3+0x^2+9x-5}\qquad 2x^2+x+5$$

$$\underline{4x^3-2x^2}$$

$$2x^2+9x$$

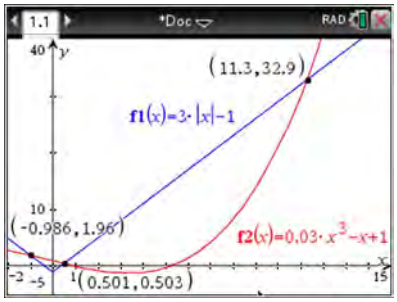
$$\underline{2x^2-x}$$

$$10x-5$$

$$\underline{10x-5}$$

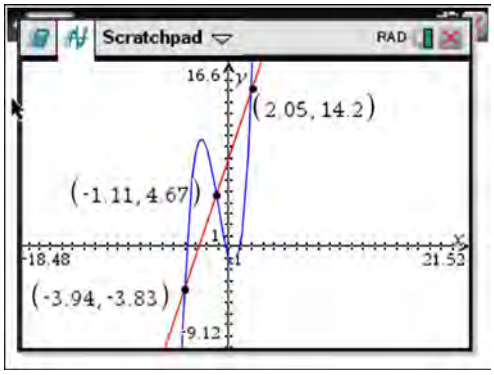
REF: 081713aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

429 ANS: 2



REF: 061705aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

430 ANS: 4



REF: 061622aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

431 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

432 ANS: 4

	Bar Harbor	Phoenix
Minimum	31.386	66.491
Midline	55.3	86.729
Maximum	79.214	106.967
Range	47.828	40.476

REF: 061715aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
KEY: maximum/minimum

433 ANS: 3

REF: 081604aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: probability

434 ANS: 3 REF: 061710aii NAT: S.IC.A.2 TOP: Analysis of Data

435 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: 011713aii NAT: S.ID.B.6 TOP: Regression KEY: choose model

436 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

437 ANS: 3 REF: 011710aii NAT: F.BF.A.1 TOP: Operations with Functions

438 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

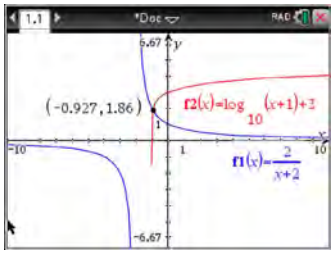
439 ANS: 1

$P(28) = 5(2)^{\frac{98}{28}} \approx 56$

REF: 011702aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

440 ANS: 1 REF: 081616aii NAT: F.TF.A.1 TOP: Unit Circle
KEY: bimodalgraph

441 ANS: 2



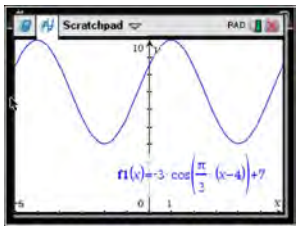
REF: 011712aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

442 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

443 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

444 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

445 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: 081709aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: logarithmic

446 ANS: 4

(1) $\frac{B(60)-B(10)}{60-10} \approx 28\%$ (2) $\frac{B(69)-B(19)}{69-19} \approx 33\%$ (3) $\frac{B(72)-B(36)}{72-36} \approx 38\%$ (4) $\frac{B(73)-B(60)}{73-60} \approx 46\%$

REF: 011721aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

447 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: 081606aii NAT: A.REI.D.11 TOP: Quadratic-Linear Systems

448 ANS: 1

$d = 18;\ r = \pm\frac{5}{4}$

REF: 011714aii NAT: F.BF.A.2 TOP: Sequences KEY: explicit

449 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: 081605aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

450 ANS: 3 REF: 061722aii NAT: A.CED.A.1 TOP: Modeling Rationals

451 ANS: 1

$$\frac{2x}{x-2}\left(\frac{x}{x}\right)-\frac{11}{x}\left(\frac{x-2}{x-2}\right)=\frac{8}{x^2-2x}$$

$$2x^2-11x+22=8$$

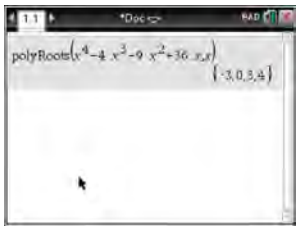
$$2x^2-11x+14=0$$

$$(2x-7)(x-2)=0$$

$$x=\frac{7}{2},2$$

REF: 061719aii NAT: A.REI.A.2 TOP: Solving Rationals

452 ANS: 1



$$x^4-4x^3-9x^2+36x=0$$

$$x^3(x-4)-9x(x-4)=0$$

$$(x^3-9x)(x-4)=0$$

$$x(x^2-9)(x-4)=0$$

$$x(x+3)(x-3)(x-4)=0$$

$$x=0,\pm3,4$$

REF: 061606aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

453 ANS: 4

$$S_n=\frac{32-32(.8)^{12}}{1-.8}\approx 149$$

REF: 081721aii NAT: F.BF.B.7 TOP: Series KEY: geometric

454 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

455 ANS: 3
(3) repeats 3 times over 2π.

REF: 011722aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: recognize | bimodalgraph

456 ANS: 4 REF: 061706aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

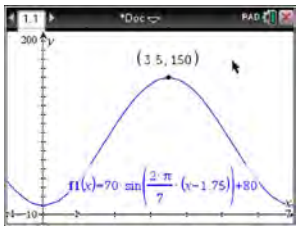
457 ANS: 2

$\bar{x} + 2\sigma$ represents approximately 48% of the data.

REF: 061609aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

458 ANS: 4 REF: 081718aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: amplitude

459 ANS: 3

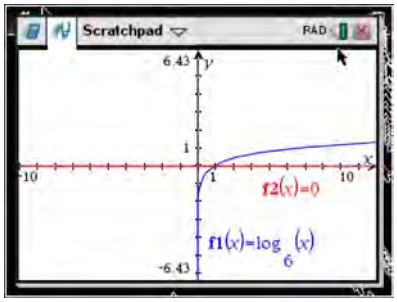


$H(t)$ is at a minimum at $70(-1) + 80 = 10$

REF: 061613aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
KEY: maximum/minimum

460 ANS: 2 REF: 011720aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

461 ANS: 1



REF: 061618aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

462 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: 061714aii NAT: S.CP.A.3 TOP: Conditional Probability

463 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

464 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

465 ANS: 1

$$\begin{array}{r} 3x^2 + 4x - 1 \\ 2x+3 \overline{)\,6x^3 + 17x^2 + 10x + 2} \\ \underline{6x^3 + 9x^2} \\ 8x^2 + 10x \\ \underline{8x^2 + 12x} \\ -2x + 2 \\ \underline{-2x - 3} \\ 5 \end{array}$$

REF: fall1503aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

466 ANS: 3

$1.0525^{\frac{1}{12}} \approx 1.00427$

REF: 061621aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

467 ANS: 2

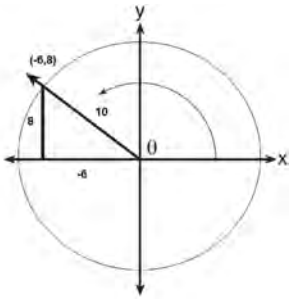
$$x(30 - 0.01x) - (0.15x^3 + 0.01x^2 + 2x + 120) = 30x - 0.01x^2 - 0.15x^3 - 0.01x^2 - 2x - 120$$

$$= -0.15x^3 - 0.02x^2 + 28x - 120$$

REF: 061709aii NAT: F.BF.A.1 TOP: Operations with Functions

468 ANS: 1

$\cos\theta = -\frac{6}{10} = -\frac{3}{5}$



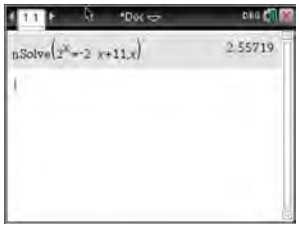
REF: 061617aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: extension to reals

469 ANS: 3 REF: 061607aii NAT: S.IC.A.2 TOP: Analysis of Data

470 ANS: 2 REF: 081717aii NAT: S.IC.B.3 TOP: Analysis of Data

471 ANS: 3 REF: 081724aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, general

472 ANS: 2



REF: 081603aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

473 ANS: 4 REF: 081707aii NAT: F.TF.A.2 TOP: Reference Angles
KEY: bimodalgraph

474 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

475 ANS: 1
The car lost approximately 19% of its value each year.

REF: 081613aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

476 ANS: 4 REF: 081622aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

477 ANS: 2 REF: 061724aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

478 ANS: 1

$$\frac{157}{25+47+157}$$

REF: 081607aii NAT: S.CP.A.4 TOP: Conditional Probability

479 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

480 ANS: 3 REF: 081705aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
KEY: increasing/decreasing

481 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

482 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

483 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

484 ANS: 4 REF: 081708aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

485 ANS: 4

$$496 \pm 2(115)$$

REF: 011718aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: interval

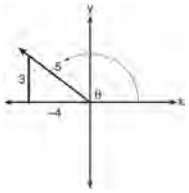
486 ANS: 3

$0.75^{\frac{1}{10}} \approx .9716$

REF: 061713aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

487 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

488 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

489 ANS: 3 REF: 061623aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive, geometric

490 ANS: 1

REF: 081711aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

491 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, geometric

492 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: fall1501aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

493 ANS: 2

$h(x)$ does not have a y-intercept.

REF: 011719aii NAT: F.IF.C.9 TOP: Comparing Functions

494 ANS: 1

(2) is not recursive

REF: 081608aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

495 ANS: 2

-4	1	-11	16	84
		-4	60	-304
	1	-15	76	

Since there is a remainder when the cubic is divided by $x+4$, this binomial is not a factor.

REF: 081720aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

496 ANS: 3 REF: 011708aii NAT: F.BF.B.5 TOP: Inverse of Functions
KEY: exponential

497 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

498 ANS: 2

$$x+2\overline{)\,x^3+2x^2+x+6}\qquad x^2+0x+1$$

$$\underline{x^3+2x^2}$$

$$0x^2+x$$

$$\underline{0x^2+0x}$$

$$x+6$$

$$\underline{x+2}$$

$$4$$

REF: 081611aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

499 ANS: 1

(1) $\frac{9-0}{2-1}=9$ (2) $\frac{17-0}{3.5-1}=6.8$ (3) $\frac{0-0}{5-1}=0$ (4) $\frac{17--5}{3.5-1}\approx 6.3$

REF: 011724aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: graph

500 ANS: 3 REF: 011706aii NAT: S.IC.B.3 TOP: Analysis of Data

501 ANS: 4

$1.06^{\frac{1}{52}}$

REF: 061924aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

502 ANS: 2

$$2x+3\overline{)\,4x^3+0x^2+5x+10}\qquad 2x^2-3x+7$$

$$\underline{4x^3+6x^2}$$

$$-6x^2+5x$$

$$\underline{-6x^2-9x}$$

$$14x+10$$

$$\underline{14x+21}$$

$$-11$$

REF: 061614aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

503 ANS: 4

$m^5 + m^3 - 6m = m(m^4 + m^2 - 6) = m(m^2 + 3)(m^2 - 2)$

REF: 011703aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

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

$\text{period} = \frac{2\pi}{B}$

$\frac{1}{60} = \frac{2\pi}{B}$

$B = 120\pi$

REF: 061624aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

506 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: 081601aii NAT: A.REI.B.4 TOP: Complex Conjugate Root Theorem

507 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: 061723aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

508 ANS: 1 REF: 081722aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

509 ANS: 3 REF: 061602aii NAT: A.CED.A.1 TOP: Modeling Rationals

510 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

511 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

512 ANS: 2

$$\left(m^{\frac{5}{3}}\right)^{-\frac{1}{2}}=m^{-\frac{5}{6}}=\frac{1}{\sqrt[6]{m^5}}$$

REF: 011707aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

513 ANS: 1

$$(x+3)^2+(2x-4)^2=8 \qquad b^2-4ac$$

$$x^2+6x+9+4x^2-16x+16=8 \quad 100-4(5)(17)<0$$

$$5x^2-10x+17=0$$

REF: 081719aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

514 ANS: 2

$$\frac{212}{1334}\approx.16 \quad ME=\left(z\sqrt{\frac{p(1-p)}{n}}\right)=\left(1.96\sqrt{\frac{(0.16)(0.84)}{1334}}\right)\approx 0.02 \text{ or } \frac{1}{\sqrt{1334}}\approx.027$$

REF: 081716aii NAT: S.IC.B.4 TOP: Analysis of Data

515 ANS: 1

The graph of $y=\sin x$ is unchanged when rotated 180º about the origin.

REF: 081614aii NAT: F.BF.B.3 TOP: Even and Odd Functions
KEY: graphically

516 ANS: 2 REF: 011701aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

517 ANS: 3

$\sqrt{56-x} = x$ –8 is extraneous.

$56 - x = x^2$

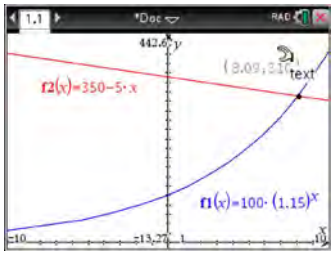
$0 = x^2 + x - 56$

$0 = (x+8)(x-7)$

$x = 7$

REF: 061605aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

518 ANS: 2



REF: 011716aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

519 ANS: 4

$y = g(x) = (x-2)^2$ $(x-2)^2 = 3x - 2$ $y = 3(6) - 2 = 16$

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

$x^2 - 7x + 6 = 0$

$(x-6)(x-1) = 0$

$x = 6, 1$

REF: 011705aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

520 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

521 ANS: 4 REF: 061601aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

522 ANS: 3
Self selection causes bias.

REF: 061703aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

Algebra II 2 Point Regents Exam Questions
Answer Section

523 ANS:

$$\frac{103}{110+103} = \frac{103}{213}$$

REF: 061825aii NAT: S.CP.A.4 TOP: Conditional Probability

524 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

525 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

526 ANS:

$$\frac{94}{87+94+21} = \frac{94}{202}$$

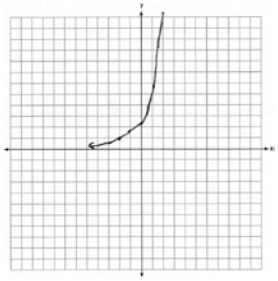
REF: 062528aii NAT: S.CP.A.4 TOP: Conditional Probability

527 ANS:

$y = 2.459(1.616)^x$

REF: 012329aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

528 ANS:



REF: 082425aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

529 ANS:

4% $8.75 = 1.25(1+r)^{49}$ or $8.75 = 1.25e^{49r}$

$7 = (1+r)^{49}$ $\ln 7 = \ln e^{49r}$

$r+1 = \sqrt[49]{7}$ $\ln 7 = 49r$

$r \approx .04$ $r = \frac{\ln 7}{49}$

$r \approx .04$

REF: 081730aii NAT: F.LE.A.4 TOP: Exponential Growth

530 ANS:

$\frac{1}{3} \times \frac{5}{12} = \frac{5}{36}$

REF: 012327aii NAT: S.CP.A.2 TOP: Probability of Compound Events

531 ANS:

$3x + 7 = x^2 - 2x + 1$ -1 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

532 ANS:

$\cot A = \frac{\cos A}{\sin A}$

$-3 = \frac{\frac{3}{\sqrt{10}}}{\sin A}$

$\sin A = \frac{3}{-3\sqrt{10}} = -\frac{1}{\sqrt{10}}$

REF: 082229aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

533 ANS:

$\sin^2\theta + (-0.7)^2 = 1$ Since θ is in Quadrant II, $\sin\theta = \sqrt{.51}$ 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: 081628aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

534 ANS:

$a_1 = 12$

$a_n = a_{n-1} + 6$

REF: 012430aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, arithmetic

535 ANS:

About 38% $\left(\frac{475}{1250}\right)$ of high school juniors in the population will choose a four-year college.

REF: 012432aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

536 ANS:

$\left(x^2 - 6\right)\left(x^2 + 2\right)$

REF: 081825aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

537 ANS:

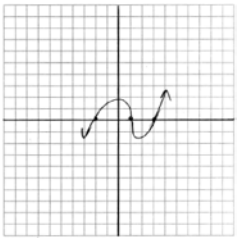
Yes. $P(\text{Bl}) = P(\text{Bl}|\,\text{Gl})$

$$0.14 + 0.26 = \frac{.14}{.35}$$

$$.4 = .4$$

REF: 062229aii NAT: S.CP.A.4 TOP: Conditional Probability

538 ANS:



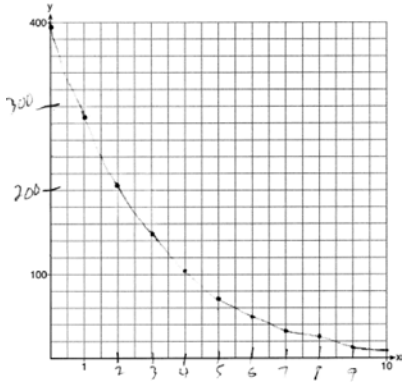
REF: 011729aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

539 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: 081629aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

540 ANS:



REF: 061729aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

541 ANS:

No, because a 180º rotation of *f* about the origin does not map *f* onto itself.

REF: 062432aii NAT: F.BF.B.3 TOP: Even and Odd Functions
KEY: graphically

542 ANS:

$S_5 = \dfrac{6-6(.8)^5}{1-.8} \approx 20.17$

REF: 062226aii NAT: F.BF.B.7 TOP: Series KEY: geometric

543 ANS:

$\dfrac{x^3+9}{x^3+8} = \dfrac{x^3+8}{x^3+8} + \dfrac{1}{x^3+8}$

$\dfrac{x^3+9}{x^3+8} = \dfrac{x^3+9}{x^3+8}$

REF: 061631aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: addition and subtraction

544 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

545 ANS:

$x^3 + 4x^2 - 9x - 36 = x^2(x+4) - 9(x+4) = \left(x^2 - 9\right)(x+4) = (x+3)(x-3)(x+4)$

REF: 012425aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

546 ANS:

$8xi^{10} - 4yi^{19} + 2yi^3 - 6xi = 8x(-1) - 4y(-i) + 2y(-i) - 6xi = -8x + 4yi - 2yi - 6xi = -8x + 2yi - 6xi$

REF: 082527aii NAT: N.CN.A.2 TOP: Imaginary Numbers

547 ANS:

$a^{x+1} = a^{\frac{2}{3}}$

$x + 1 = \frac{2}{3}$

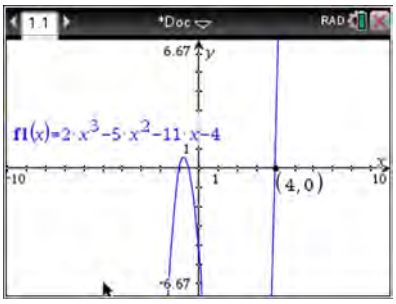
$x = -\frac{1}{3}$

REF: 012326aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: common base shown

548 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

549 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.

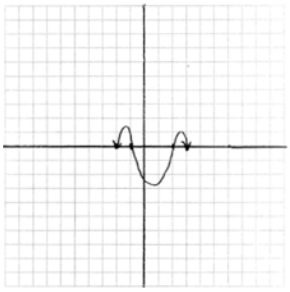


REF: spr1507aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

550 ANS:
$\frac{B(11) - B(8)}{11 - 8} \approx -10.1$ The average monthly high temperature decreases 10.1° each month from August to November.

REF: 011930aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: trigonometric

551 ANS:



REF: 011831aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

552 ANS:

$i^2 = -1$, and not 1; $10 + 10i$

REF: 011825aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

553 ANS:

$0 = \log_{10}(x - 4)$ The x-intercept of h is $(2, 0)$. f has the larger value.

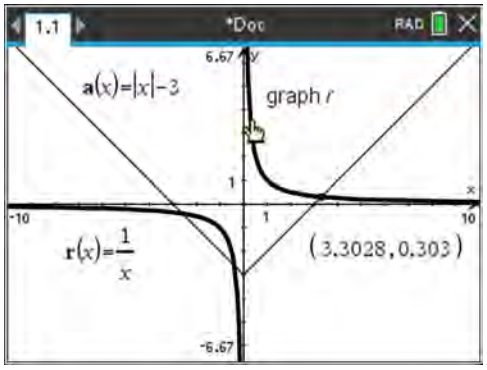
$10^0 = x - 4$

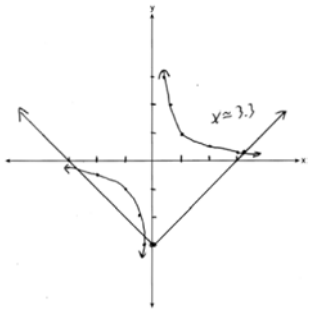
$1 = x - 4$

$x = 5$

REF: 081630aii NAT: F.IF.C.9 TOP: Comparing Functions

554 ANS:





REF: 081932aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

555 ANS:

$2(-1) + 5 = 3$

REF: 082429aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

556 ANS:

$\frac{V(7) - V(2)}{7 - 2} \approx 48$

REF: 012427aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

557 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

558 ANS:

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: 061929aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

559 ANS:

25

REF: 012429aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

560 ANS:

$A = Pe^{rt}$

$135000 = 100000e^{5r}$

$1.35 = e^{5r}$

$\ln 1.35 = \ln e^{5r}$

$\ln 1.35 = 5r$

$.06 \approx r$ or 6%

REF: 061632aii NAT: F.LE.A.4 TOP: Exponential Growth

561 ANS:

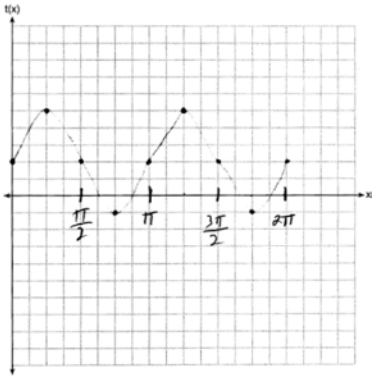
No, because $P(M / R) \neq P(M)$

$$\frac{70}{180} \neq \frac{230}{490}$$

$$0.38 \neq 0.47$$

REF: 011731aii NAT: S.CP.A.4 TOP: Conditional Probability

562 ANS:



REF: 081830aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

563 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

564 ANS:

Rewrite $\frac{4}{3}$ as $\frac{1}{3}\cdot\frac{4}{1}$, using the power of a power rule.

REF: 081725aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

565 ANS:

$$y=\frac{2}{3}x+6$$

$$x=\frac{2}{3}y+6$$

$$3x=2y+18$$

$$3x-18=2y$$

$$\frac{3}{2}x-9=y=f^{-1}(x)$$

REF: 062530aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

566 ANS:

$x = \left(y - 3\right)^3 + 1$

$x - 1 = \left(y - 3\right)^3$

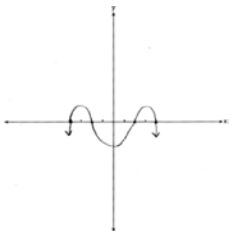
$\sqrt[3]{x - 1} = y - 3$

$\sqrt[3]{x - 1} + 3 = y$

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

REF: fall1509aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

567 ANS:



REF: 011926aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

568 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: 062427aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

569 ANS:

$b^2 - 4ac = (-4)^2 - 4(1)(13) = 16 - 52 = -36$ imaginary

REF: 062225aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

570 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: 011829aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

571 ANS:

$\frac{13.9 - 9.4}{4 - 1} = 1.5$ 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

572 ANS:

$\frac{25 - 5}{2} = 10$

REF: 062525aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: amplitude

573 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

574 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

575 ANS:
$250(1) + 2450 = 2700$ The maximum lung capacity of a person is 2700 mL.

REF: 081928aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

576 ANS:
$\left(-\frac{\sqrt{10}}{10}\right)^2 + \sin^2\theta = 1$ $-\frac{3\sqrt{10}}{10}$ as sin is negative in Quadrant III.

$$\frac{10}{100} + \sin^2\theta = \frac{100}{100}$$

$$\sin^2\theta = \frac{90}{100}$$

$$\sin\theta = \pm\frac{3}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = \pm\frac{3\sqrt{10}}{10}$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{-3\sqrt{10}/10}{-\sqrt{10}/10} = 3$$

REF: 082529aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

577 ANS:
Translation 3 units right and 4 units up

REF: 012027aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

578 ANS:
$e^{0.0532} > 1$, so $P(t)$ is increasing.

REF: 062327aii NAT: F.IF.C.8 TOP: Graphing Exponential Functions

579 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

580 ANS:
$$\left(x^{\frac{5}{3}}\right)^{\frac{6}{5}} = \left(y^{\frac{5}{6}}\right)^{\frac{6}{5}}$$

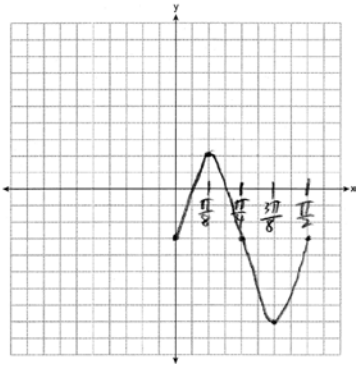
$$x^2 = y$$

REF: 011730aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

581 ANS:
$1200 \cdot 0.784 \approx 941$

REF: 081828aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict

582 ANS:



REF: 012529aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

583 ANS:
$\frac{1}{x} - \frac{1}{3} = -\frac{1}{3x}$

$\frac{3-x}{3x} = -\frac{1}{3x}$

$3 - x = -1$

$x = 4$

REF: 061625aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

584 ANS:
$\frac{p(8) - p(4)}{8 - 4} \approx 48.78$

REF: 081827aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

585 ANS:
$\frac{10.1 - -2}{2} - \frac{2.5 - -0.1}{2} = 6.05 - 1.3 = 4.75$

REF: 081930aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: amplitude

586 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: 011832aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

587 ANS:

$\sqrt{4x+1} = 11 - x$ 20 is extraneous.

$4x + 1 = 121 - 22x + x^2$

$0 = x^2 - 26x + 120$

$0 = (x - 6)(x - 20)$

$x = 6, 20$

REF: 082227aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

588 ANS:

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

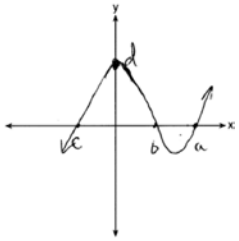
REF: 062529aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

589 ANS:

$2(0.042) = 0.084 \approx 0.08$ The percent of users making in-app purchases will be within 8% of 35%.

REF: 081832aii NAT: S.IC.A.2 TOP: Analysis of Data

590 ANS:



REF: 081732aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

591 ANS:

$x = \dfrac{2 \pm \sqrt{(-2)^2 - 4(2)(1)}}{2(2)} = \dfrac{2 \pm \sqrt{-4}}{4} = \dfrac{2 \pm 2i}{4} = \dfrac{1}{2} \pm \dfrac{i}{2}$

REF: 082532aii NAT: A.REI.B.4 TOP: Solving Quadratics

592 ANS:

$\dfrac{16 - 8}{4} = 2$

REF: 082528aii NAT: S.ID.A.4 TOP: Normal Distributions

593 ANS:

$a_1 = 4$

$a_n = 3a_{n-1}$

REF: 081931aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

594 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

595 ANS:

$D = 1.223(2.652)^A$

REF: 011826aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

596 ANS:

$\frac{20}{8} = 2.5$ $a_1 = 8$

$a_n = 2.5 \cdot a_{n-1}$

REF: 012531aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

597 ANS:

$S_{10} = \frac{15 - 15(1.03)^{10}}{1 - 1.03} \approx 171.958$

REF: 011929aii NAT: F.BF.B.7 TOP: Series KEY: geometric

598 ANS:

sample: pails of oranges; population: truckload of oranges. It is likely that about 5% of all the oranges are unsatisfactory.

REF: 011726aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

599 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

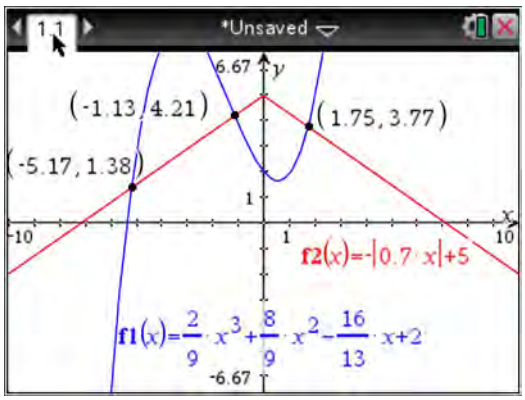
600 ANS:

$\frac{63}{189} = \frac{1}{3}$ $a_1 = 189$

$a_n = \frac{1}{3} a_{n-1}$

REF: 062329aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

601 ANS:



REF: fall1510aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

602 ANS:

$6x\left(\frac{1}{2x}-\frac{5}{6}=\frac{3}{x}\right)$

$3-5x=18$

$-15=5x$

$-3=x$

REF: 012526aii NAT: A.REI.A.2 TOP: Solving Rationals

603 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

604 ANS:

$\left(p^2 n^{\frac{1}{2}}\right)^8 \sqrt{p^5 n^4}=\left(p^{16}n^4\right)p^2 n^2\sqrt{p}=p^{18}n^6\sqrt{p}$

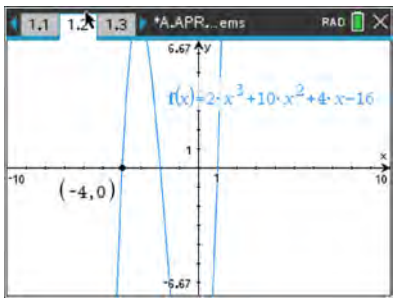
REF: 012025aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

605 ANS:

$j(-x)=(-x)^4-3(-x)^2-4=x^4-3x^2-4$ Since $j(x)=j(-x)$, the function is even.

REF: 081731aii NAT: F.BF.B.3 TOP: Even and Odd Functions
KEY: algebraically

606 ANS:



Since -4 is a zero, $x + 4$ is a factor.

REF: 012426aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

607 ANS:

$P(W / D) = \dfrac{P(W \wedge D)}{P(D)} = \dfrac{.4}{.5} = .8$

REF: 081726aii NAT: S.CP.A.3 TOP: Conditional Probability

608 ANS:

$C(t) = 130(0.5)^{\frac{t}{5.5}}$

REF: 082430aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

609 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

610 ANS:

$\dfrac{60 - 20}{4 - 2} = \dfrac{40}{2} = 20$

REF: 082225aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: graph

611 ANS:

$$\frac{x^{\frac{8}{3}}}{x^{\frac{4}{3}}} = x^y$$

$$x^{\frac{4}{3}} = x^y$$

$$\frac{4}{3} = y$$

REF: spr1505aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: numbers

612 ANS:

The expression is of the form $y^2 - 5y - 6$ or $(y-6)(y+1)$. Let $y = 4x^2 + 5x$:

$$\left(4x^2 + 5x - 6\right)\left(4x^2 + 5x + 1\right)$$

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

REF: fall1512aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: a>1

613 ANS:

Self selection is a cause of bias because people with more free time are more likely to respond.

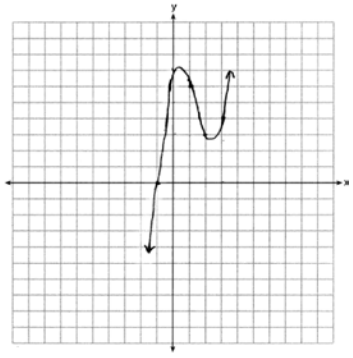
REF: 061828aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

614 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: 061629aii NAT: S.CP.B.7 TOP: Addition Rule

615 ANS:



REF: 012032aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

616 ANS:

$F(t) = 169.136(.971)^t$

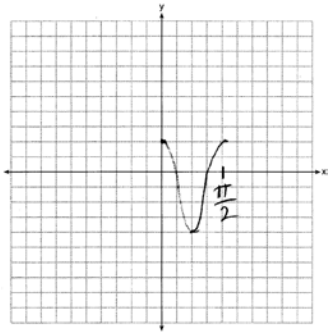
REF: 062232aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

617 ANS:

$r = \frac{360}{300} = 1.2 \;\; S_n = \frac{300 - 300(1.2)^n}{1 - 1.2} \;\; S_{10} = \frac{300 - 300(1.2)^{10}}{1 - 1.2} \approx 7787.6$

REF: 012029aii NAT: F.BF.B.7 TOP: Series KEY: geometric

618 ANS:



REF: 061628aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions KEY: graph

619 ANS:

$\frac{\sqrt[5]{a^{10}}}{\left(a^3\right)^{\frac{1}{2}}} = \frac{a^{\frac{10}{5}}}{a^{\frac{3}{2}}} = \frac{a^{\frac{20}{10}}}{a^{\frac{15}{10}}} = a^{\frac{5}{10}} \quad x = \frac{1}{2}$

REF: 012528aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

620 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: 012325aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

621 ANS:

$\frac{3}{n} = \frac{2}{n^2}$ 0 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

622 ANS:

$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$

$\frac{7x + 7 - 4x}{2x^2 + 2x} = \frac{1}{4}$

$2x^2 + 2x = 12x + 28$

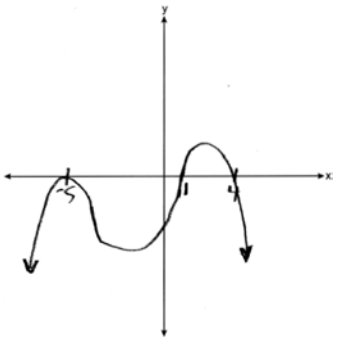
$x^2 - 5x - 14 = 0$

$(x - 7)(x + 2) = 0$

$x = 7, -2$

REF: 061926aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

623 ANS:



REF: 062428aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

624 ANS:

$P(-2) = 60$ $Q(-2) = 0$ $(x + 2)$ is a factor of $Q(x)$ since $Q(-2) = 0$.

REF: 081929aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

625 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: 061732aii NAT: S.CP.A.4 TOP: Conditional Probability

626 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

627 ANS:

q has the smaller minimum value for the domain $[-2,2]$. h's minimum is -1 $\left(2(-1)+1\right)$ and q's minimum is -8.

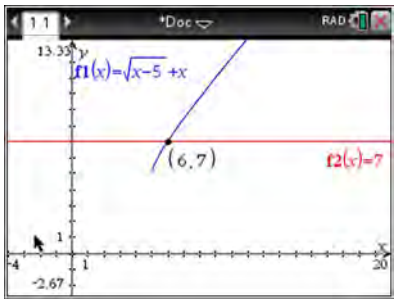
REF: 011830aii NAT: F.IF.C.9 TOP: Comparing Functions

628 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

629 ANS:



$\sqrt{x-5} = -x+7$ $\sqrt{x-5} = -9+7 = -2$ is extraneous.

$$x-5 = x^2 - 14x + 49$$
$$0 = x^2 - 15x + 54$$
$$0 = (x-6)(x-9)$$
$$x = 6, 9$$

REF: spr1508aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

630 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: 082432aii NAT: A.REI.B.4 TOP: Solving Quadratics

631 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

632 ANS:

$g(3) = 0; \quad 0 = 3^3 + a(3)^2 - 5(3) + 6$

$0 = 27 + 9a - 15 + 6$

$-18 = 9a$

$a = -2$

REF: 062328aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

633 ANS:

$r(2) = -6$. Since there is a remainder when the cubic is divided by $x - 2$, this binomial is not a factor.

2	1	-4	4	6
		2	-4	0
	1	-2	0	-6

REF: 061725aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

634 ANS:

$$x-2\overline{)\,3x^2+7x-20} \quad 3x+13+\frac{6}{x-2}$$

$3x+13$

$3x^2 - 6x$

$13x - 20$

$13x - 26$

6

REF: 011732aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

635 ANS:

$3x^3 + x^2 + 3xy + y = x^2(3x+1) + y(3x+1) = \left(x^2 + y\right)(3x+1)$

REF: 011828aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

636 ANS:
$0.133696 \times 9256 \approx 1237$

REF: 082230aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict

637 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

638 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

639 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

640 ANS:

$t^2 + \left(\frac{4}{7}\right)^2 = 1 \qquad -\frac{\sqrt{33}}{7}$

$$t^2 + \frac{16}{49} = \frac{49}{49}$$
$$t^2 = \frac{33}{49}$$
$$t = \frac{\pm\sqrt{33}}{7}$$

REF: 011931aii NAT: F.TF.A.2 TOP: Unit Circle

641 ANS:

$B(t) = 100(2)^{\frac{t}{30}}$

REF: 012031aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

642 ANS:

$(4-3i)(5+2yi-5+2yi)$

$(4-3i)(4yi)$

$16yi-12yi^2$

$12y+16yi$

REF: spr1506aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

643 ANS:

Since there is no remainder when the cubic is divided by $x+3$, this binomial is a factor.

-3	7	27	9	-27
		-21	-18	27
	7	6	-9	0

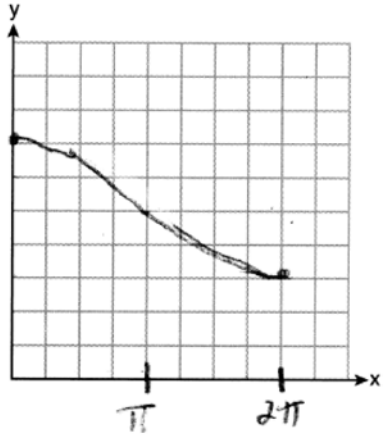
REF: 082426aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

644 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: 082427aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

645 ANS:



REF: 062231aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

646 ANS:

$\frac{p(x)}{x-1} = x^2 + 7 + \frac{5}{x-1}$

$p(x) = x^3 - x^2 + 7x - 7 + 5$

$p(x) = x^3 - x^2 + 7x - 2$

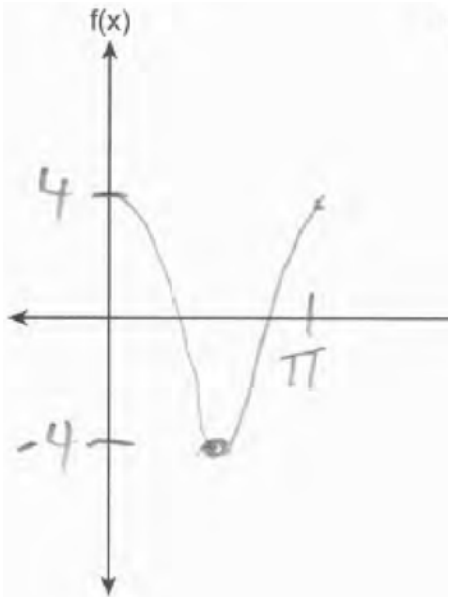
REF: 061930aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

647 ANS:

Yes. Using a 95% confidence interval, values outside the interval $3.95 - 4.05$ are unusual.

REF: 012532aii NAT: S.IC.A.2 TOP: Analysis of Data

648 ANS:



REF: 062531aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

649 ANS:

$3x - 2x^2 i + 6i - 4xi^2 + 2x^2 i = 3x + 6i + 4x = 7x + 6i$

REF: 062425aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

650 ANS:

$xi(-6i)^2 = xi(36i^2) = 36xi^3 = -36xi$

REF: 081627aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

651 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

652 ANS:

$\sqrt{x + 5} = x + 3$ –4 is extraneous.

$x + 5 = x^2 + 6x + 9$

$0 = x^2 + 5x + 4$

$0 = (x + 4)(x + 1)$

$x = -4, -1$

REF: 082530aii NAT: A.REI.A.2 TOP: Solving Radicals

653 ANS:

$$\begin{array}{r} 2a^2 + 5a + 2 \\ 3a - 2\overline{)\ 6a^3 + 11a^2 - 4a - 9} \\ \underline{6a^3 - 4a^2} \\ 15a^2 - 4a \\ \underline{15a^2 - 10a} \\ 6a - 9 \\ \underline{6a - 4} \\ -5 \end{array} \quad 2a^2 + 5a + 2 - \frac{5}{3a - 2}$$

REF: 061829aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

654 ANS:

$.705 \pm 2(.045)$ No, because .67 falls within the confidence interval.

.615 –.795

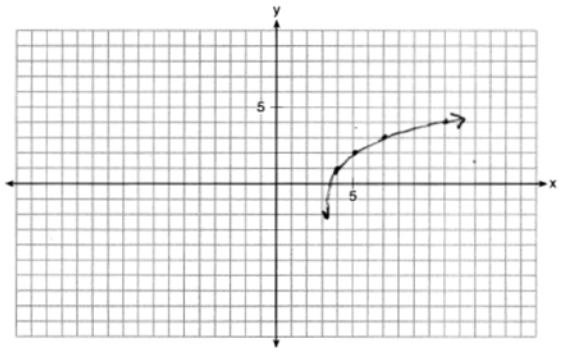
REF: 062532aii NAT: S.IC.A.2 TOP: Analysis of Data

655 ANS:

$\sqrt[3]{81} = \sqrt[3]{3^4} = 3^{\frac{4}{3}}$ $a = \frac{4}{3}$

REF: 062230aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

656 ANS:



REF: 011932aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

657 ANS:

$$S_{30} = \frac{42000 - 42000(1.03)^{30}}{1 - 1.03} \approx 1,998,000$$

REF: 082531aii NAT: F.BF.B.7 TOP: Series KEY: geometric

658 ANS:

REF: 082428aii NAT: S.ID.A.4 TOP: Normal Distributions

659 ANS:

$$\left(\frac{1}{\sqrt[3]{y^2}}\right)y^4 = \frac{y^{\frac{12}{3}}}{y^{\frac{2}{3}}} = y^{\frac{10}{3}} \qquad n = \frac{10}{3}$$

REF: 012428aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

660 ANS:

$$2x^2 - 7x + 4 = 11 - 2x \quad y = 11 - 2\left(\frac{7}{2}\right) = 4 \quad \left\{\left(\frac{7}{2}, 4\right), (-1, 13)\right\}$$

$$2x^2 - 5x - 7 = 0 \qquad y = 11 - 2(-1) = 13$$

$$(2x - 7)(x + 1) = 0$$

$$x = \frac{7}{2}, -1$$

REF: 082232aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

661 ANS:

$a_1 = 4 \qquad a_8 = 639$

$a_n = 2a_{n-1} + 1$

REF: 081729aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, general

662 ANS:

$$\frac{2x^{\frac{3}{2}}}{2x^{\frac{2}{2}}} = x^{\frac{1}{2}} = \sqrt{x}$$

REF: 081826aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

663 ANS:

$\pi < \theta < 2\pi \rightarrow$ Quadrant III or IV θ must be in Quadrant IV, where $\tan\theta$ is negative.

$\cos\theta = \frac{\sqrt{3}}{4} \rightarrow$ Quadrant I or IV

REF: 012332aii NAT: F.TF.C.8 TOP: Finding the Terminal Side of an Angle

664 ANS:

left 3, down 5

REF: 012525aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

665 ANS:

$\frac{306.25 - 156.25}{70 - 50} = \frac{150}{20} = 7.5$ 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

666 ANS:

$$\frac{55}{t} = \frac{65}{t+3}$$

$65t = 55t + 165$

$10t = 165$

$t = 16.5$

$t + 3 = 19.5$

REF: 082431aii NAT: A.REI.A.2 TOP: Solving Rationals

667 ANS:

$P(A + B) = P(A) \cdot P(B|A) = 0.8 \cdot 0.85 = 0.68$

REF: 011928aii NAT: S.CP.A.3 TOP: Conditional Probability

668 ANS:

$\sqrt{x-2} = 4-x$ 6 is extraneous.

$x-2 = 16-8x+x^2$

$0 = x^2-9x+18$

$0 = (x-6)(x-3)$

$x = 6, 3$

REF: 062526aii NAT: A.REI.A.2 TOP: Solving Radicals

669 ANS:

Pick random names from a list of all students and ask each one his method.

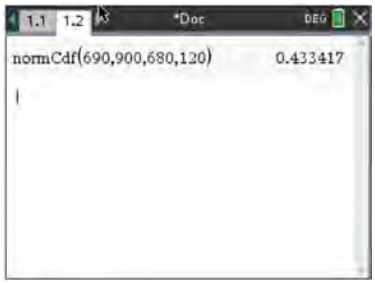
REF: 062325aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

670 ANS:

$$\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}} = \frac{x^{\frac{2}{3}}y^{\frac{5}{3}}}{x^{\frac{3}{4}}y} = \frac{x^{\frac{8}{12}}y^{\frac{20}{12}}}{x^{\frac{9}{12}}y^{\frac{12}{12}}} = x^{-\frac{1}{12}}y^{\frac{2}{3}}$$

REF: 011925aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

671 ANS:



43

REF: 012328aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

672 ANS:

$\left(x^3+2x-1\right)\left(x^2+7\right)-3\left(x^4-5x\right)$

$x^5+7x^3+2x^3+14x-x^2-7-3x^4+15x$

$x^5-3x^4+9x^3-x^2+29x-7$

REF: 012330aii NAT: F.BF.A.1 TOP: Operations with Functions

673 ANS:

$x^4 - 5x^2 + 4$

$(x^2 - 4)(x^2 - 1)$

$(x + 2)(x - 2)(x + 1)(x - 1)$

REF: 012331aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

674 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

675 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: 062426aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

676 ANS:

$\frac{9}{6} = 1.5 \;\; a_1 = 6$

$a_n = 1.5 \cdot a_{n-1}$

REF: 061931aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

677 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: 081632aii NAT: S.CP.B.7 TOP: Addition Rule

678 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. $\left(\sqrt{9}\right)^5 = 243$

REF: 081926aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

679 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

680 ANS:
No, because $P(F / CR) \neq P(F)$

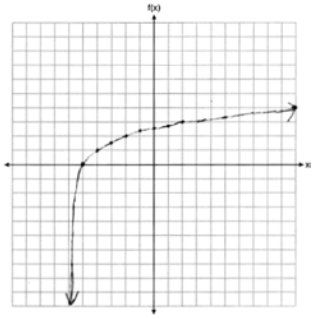
$$\frac{36}{42+36} \neq \frac{17+37+36+15}{39+17+42+12+17+37+36+15}$$

$$\frac{36}{78} \neq \frac{105}{215}$$

$$\frac{6}{13} \neq \frac{21}{43}$$

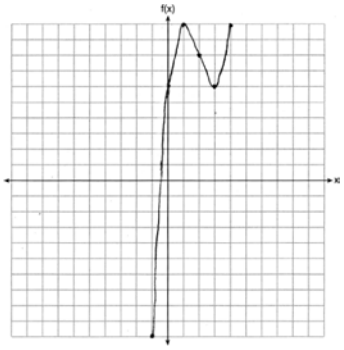
REF: 082231aii NAT: S.CP.A.4 TOP: Conditional Probability

681 ANS:



REF: 061927aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

682 ANS:



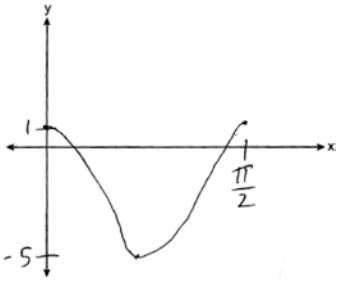
REF: 061826aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

683 ANS:

$$\frac{45}{45+15} = \frac{45}{60}$$

REF: 082525aii NAT: S.CP.A.4 TOP: Conditional Probability

684 ANS:



REF: 082328aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

685 ANS:

$\frac{P(10.5)-P(0)}{10.5-0} \approx 10.76$ fruit flies per day

REF: 082332aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

686 ANS:

$0 < e^{\frac{\left(\ln\frac{1}{2}\right)}{1590}} < 1$, so $M(t)$ represents decay.

REF: 011728aii NAT: F.IF.C.8 TOP: Graphing Exponential Functions

687 ANS:

$(1-i)(1-i)(1-i) = (1-2i+i^2)(1-i) = -2i(1-i) = -2i+2i^2 = -2-2i$

REF: 011725aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

688 ANS:

$\left(2xi^3-3y\right)^2 = 4x^2i^6 - 12xyi^3 + 9y^2 = -4x^2 + 12xyi + 9y^2$

REF: 012431aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

689 ANS:

$-6(x+3)\left(\frac{-3}{x+3} - \frac{x}{6} + 1 = 0\right)$

$18 + x(x+3) - 6(x+3) = 0$

$18 + x^2 + 3x - 6x - 18 = 0$

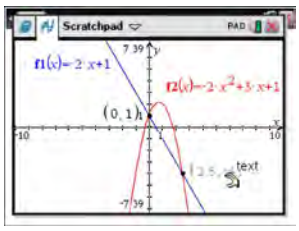
$x^2 - 3x = 0$

$x(x-3) = 0$

$x = 0, 3$

REF: 081829aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

690 ANS:



$-2x+1=-2x^2+3x+1$

$2x^2-5x=0$

$x(2x-5)=0$

$x=0,\frac{5}{2}$

REF: fall1507aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

691 ANS:

$\left(-\frac{2}{7}\right)^2+\sin^2\theta=1$ $\frac{3\sqrt{5}}{7}$ as sin 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: 012527aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

692 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: 061830aii NAT: F.IF.A.3 TOP: Sequences KEY: recursive

693 ANS:

$x=\frac{-5\pm\sqrt{5^2-4(3)(8)}}{2(3)}=-\frac{5}{6}\pm\frac{i\sqrt{71}}{6}$

REF: 082327aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

694 ANS:

$\frac{2\pi}{\frac{2\pi}{5}}=5$ The wheel rotates every 5 minutes.

REF: 062429aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

695 ANS:

$(x-1)^2+5(x-1)-6$

u^2+5u-6

$(u+6)(u-1)$

$(x-1+6)(x-1-1)$

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

REF: 062527aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

696 ANS:

$$\left(\frac{y^{\frac{17}{8}}}{y^{\frac{10}{8}}}\right)^{-4} = y^n \quad n=-\frac{7}{2}$$

$$\left(y^{\frac{7}{8}}\right)^{-4} = y^n$$

$$y^{-\frac{7}{2}} = y^n$$

REF: 082228aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

697 ANS:

$$\sqrt[3]{x}\bullet\sqrt{x} = x^{\frac{1}{3}}\bullet x^{\frac{1}{2}} = x^{\frac{2}{6}}\bullet x^{\frac{3}{6}} = x^{\frac{5}{6}}$$

REF: 061731aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

698 ANS:

$\ln e^{0.49x} = \ln 7.5$

$0.49x = \ln 7.5$

$x = \dfrac{\ln 7.5}{0.49} \approx 4.112$

REF: 062330aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

699 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: 062228aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

700 ANS:

$\frac{165 + 66 - 33}{825} = \frac{198}{825}$

REF: 081925aii NAT: S.CP.B.7 TOP: Addition Rule

701 ANS:

Amplitude, because the height of the graph shows the volume of the air.

REF: 081625aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: mixed

702 ANS:

69

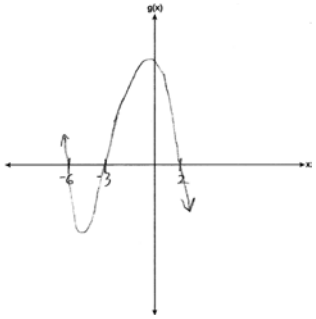
REF: 061726aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

703 ANS:

$x^3 - 2x^2 - 9x + 18 = x^2(x - 2) - 9(x - 2) = \left(x^2 - 9\right)(x - 2) = (x + 3)(x - 3)(x - 2)$

REF: 082226aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

704 ANS:



REF: 082526aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

705 ANS:

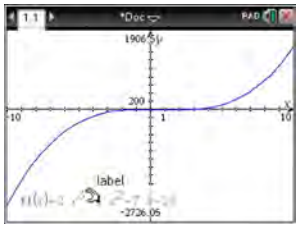
$$\frac{1}{8}+\frac{1}{6}=\frac{1}{t_b};\ \frac{24t_b}{8}+\frac{24t_b}{6}=\frac{24t_b}{t_b}$$

$$3t_b+4t_b=24$$

$$t_b=\frac{24}{7}\approx 3.4$$

REF: 011827aii NAT: A.REI.A.2 TOP: Solving Rationals

706 ANS:



$$x-5\overline{)\,2x^3-4x^2-7x-10}\quad\begin{array}{r}2x^2+6x+23\\ \\ \\ \\ \\ \\ \end{array}$$

$$\underline{2x^3-10x^2}$$

$$6x^2-7x$$

$$\underline{6x^2-30x}$$

$$23x-10$$

$$\underline{23x-115}$$

$$105$$

Since there is a remainder, $x-5$ is not a factor.

REF: 061627aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

707 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

708 ANS:

Julia: $V(x)=33,400(0.85^{\frac{1}{12}})^{12x}\approx 33,400(0.9865)^{12x}$

REF: 012530aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

709 ANS:

$$\frac{-1}{\sqrt{2^2+(-1)^2}}=-\frac{1}{\sqrt{5}}$$

REF: 061832aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: extension to reals

710 ANS:

$\sqrt{x-4} = -x+6$ $\sqrt{x-4} = -8+6 = -2$ is extraneous.

$x-4 = x^2 - 12x + 36$

$0 = x^2 - 13x + 40$

$0 = (x-8)(x-5)$

$x = 5, 8$

REF: 061730aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

Algebra II 4 Point Regents Exam Questions
Answer Section

711 ANS:

$P(F|L) = \frac{12}{27}$ $P(F) = \frac{22}{45}$ Since $P(F|L) \neq P(F)$, the events are not independent.

REF: 061936aii NAT: S.CP.A.4 TOP: Conditional Probability

712 ANS:

$\frac{m(4) - m(-1)}{4 - -1} = \frac{81 - 1}{5} = 16$ $p(x)$ has a greater rate of change

$\frac{p(4) - p(-1)}{4 - -1} = 16.1\overline{3}$

REF: 012534aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

713 ANS:

$\frac{47}{108} = \frac{1}{4} + \frac{116}{459} - P(M \text{ and } J)$; No, because $\frac{31}{459} \neq \frac{1}{4} \cdot \frac{116}{459}$

$P(M \text{ and } J) = \frac{31}{459}$

REF: 011834aii NAT: S.CP.B.7 TOP: Addition Rule

714 ANS:

$a_n = x^{n-1}(x+1)$ $x^{n-1} = 0$ $x + 1 = 0$

$x = 0$ $x = -1$

REF: spr1511aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

715 ANS:

Yes, $x^3 + 3x^2 - 2x - 6$ $(x^2 - 2)(x + 3) = 0$

$x^2(x+3) - 2(x+3)$ $x = \pm\sqrt{2}, -3$

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

REF: 082534aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

716 ANS:

$(x-4)^2+((x-6)-1)^2=9 \quad 7-y=6 \;\; 4-y=6 \;\; (7,1),(4,-2)$

$x^2-8x+16+x^2-14x+49-9=0 \quad 1=y \qquad -2=y$

$2x^2-22x+56=0$

$x^2-11x+28=0$

$(x-7)(x-4)=0$

$x=7,4$

REF: 082436aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

717 ANS:

$29.101 \pm 2 \cdot 0.934 = 27.23 - 30.97$. Yes, since 30 falls within the 95% interval.

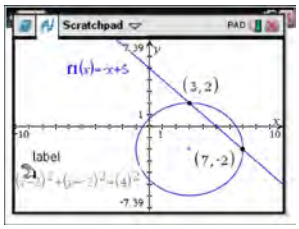
REF: 011935aii NAT: S.IC.A.2 TOP: Analysis of Data

718 ANS:

$\dfrac{B(10)-B(6)}{10-6} \approx -3.88$. The average monthly high temperature decreases about 4º each month from June and October.

REF: 012336aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: trigonometric

719 ANS:



$y=-x+5 \quad y=-7+5=-2$

$(x-3)^2+(-x+5+2)^2=16 \qquad y=-3+5=2$

$x^2-6x+9+x^2-14x+49=16$

$2x^2-20x+42=0$

$x^2-10x+21=0$

$(x-7)(x-3)=0$

$x=7,3$

REF: 061633aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

720 ANS:

$3\sqrt{x} - 2x = -5$ 1 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: 011936aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

721 ANS:

normcdf(510, 540, 480, 24) = 0.0994 $z = \frac{510 - 480}{24} = 1.25$ $1.25 = \frac{x - 510}{20}$ $2.5 = \frac{x - 510}{20}$ 535-560

$z = \frac{540 - 480}{24} = 2.5$ $x = 535$ $x = 560$

REF: fall1516aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: probability

722 ANS:

$y = 101.523(.883)^x$ $29 = 101.523(.883)^x$

$\frac{29}{101.523} = (.883)^x$

$\log \frac{29}{101.523} = x \log(.883)$

$\frac{\log \frac{29}{101.523}}{\log(.883)} = x$

$x \approx 10.07$

REF: 012036aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

723 ANS:

$M = 172600 \bullet \frac{0.00305(1 + 0.00305)^{12 \cdot 15}}{(1 + 0.00305)^{12 \cdot 15} - 1} \approx 1247$ $1100 = (172600 - x) \bullet \frac{0.00305(1 + 0.00305)^{12 \cdot 15}}{(1 + 0.00305)^{12 \cdot 15} - 1}$

$1100 \approx (172600 - x) \bullet (0.007228)$

$152193 \approx 172600 - x$

$20407 \approx x$

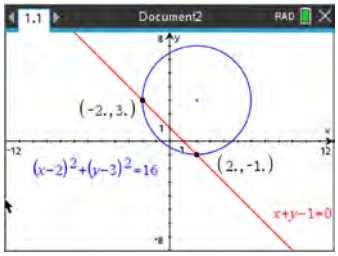
REF: 061734aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

724 ANS:

$a_n = 100(.8)^{n-1}$ $S_{20} = \dfrac{100 - 100(.8)^{20}}{1 - .8} \approx 494$ No, because $494 > 40 \times 12$.

REF: 012033aii NAT: F.BF.B.7 TOP: Series KEY: geometric

725 ANS:



$y = -x + 1$ $y = -2 + 1 = -1$ $(2, -1)$

$(x-2)^2 + (-x+1-3)^2 = 16$ $y = 2 + 1 = 3$ $(-2, 3)$

$x^2 - 4x + 4 + x^2 + 4x + 4 = 16$

$2x^2 = 8$

$x = -2, 2$

REF: 012035aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

726 ANS:

$(3x^2 - 4x + 7)(x - 2) - (x - 2)^3$

$3x^3 - 6x^2 - 4x^2 + 8x + 7x - 14 - (x^3 - 6x^2 + 12x - 8)$

$3x^3 - 10x^2 + 15x - 14 - x^3 + 6x^2 - 12x + 8$

$2x^3 - 4x^2 + 3x - 6$

REF: 062535aii NAT: F.BF.A.1 TOP: Operations with Functions

727 ANS:

$7 = 20(0.5)^{\frac{t}{8.02}}$

$\log 0.35 = \log 0.5^{\frac{t}{8.02}}$

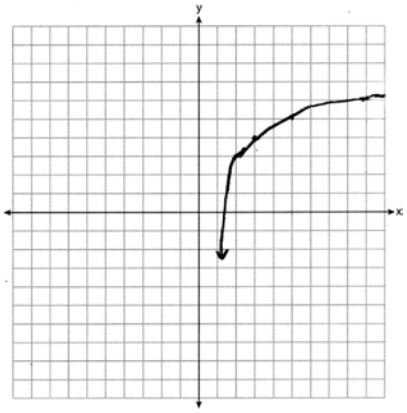
$\log 0.35 = \dfrac{t \log 0.5}{8.02}$

$\dfrac{8.02 \log 0.35}{\log 0.5} = t$

$t \approx 12$

REF: 081634aii NAT: F.LE.A.4 TOP: Exponential Decay

728 ANS:



$x = 1, y = 1$

REF: 062436aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

729 ANS:

$\frac{f(4) - f(-2)}{4 - -2} = \frac{80 - 1.25}{6} = 13.125$ $g(x)$ has a greater rate of change

$\frac{g(4) - g(-2)}{4 - -2} = \frac{179 - -49}{6} = 38$

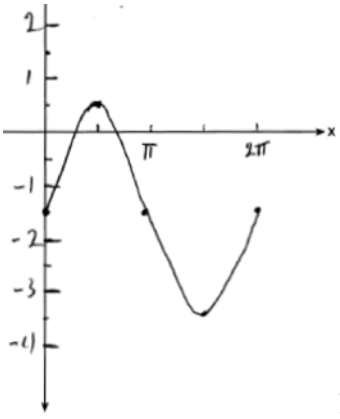
REF: 061636aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

730 ANS:

$138.905 \pm 2 \cdot 7.95 = 123 - 155$. No, since 125 (50% of 250) falls within the 95% interval.

REF: 011835aii NAT: S.IC.A.2 TOP: Analysis of Data

731 ANS:



Part a sketch is shifted $\frac{\pi}{3}$ units right.

REF: 081735aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

732 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

733 ANS:

$2 = e^{0.0375t}$

$t \approx 18.5$

REF: 081835aii NAT: F.LE.A.4 TOP: Exponential Growth

734 ANS:

$x^2 - 6x = -17$ 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

735 ANS:

a) $p(t) = 11000(2)^{\frac{t}{20}}$; b) $\dfrac{1000000}{11000} = \dfrac{11000(2)^{\frac{t}{20}}}{11000}$

$\log \dfrac{1000}{11} = \log 2^{\frac{t}{20}}$

$\log \dfrac{1000}{11} = \dfrac{t \cdot \log 2}{20}$

$\dfrac{20 \log \frac{1000}{11}}{\log 2} = t$

$t \approx 130.13$

REF: 082233aii NAT: F.LE.A.4 TOP: Exponential Growth

736 ANS:

$x^3 \quad +4$

$x+2 \overline{)\, x^4 + 2x^3 + 4x - 10}$ $x^3 + 4 - \dfrac{18}{x+2}$. No, because there is a remainder.

$\underline{x^4 + 2x^3}$

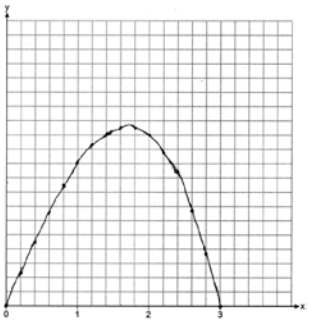
$4x - 10$

$\underline{4x + 8}$

-18

REF: 011934aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

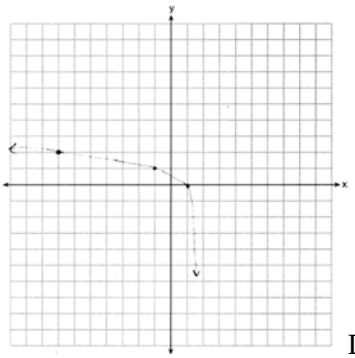
737 ANS:



12.6

REF: 082234aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

738 ANS:



Domain: $x < 2$, Asymptote $x = 2$

REF: 012034aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

739 ANS:

$S_n = \dfrac{33000 - 33000(1.04)^n}{1 - 1.04}$ $S_{15} = \dfrac{33000 - 33000(1.04)^{15}}{1 - 1.04} \approx 660778.39$

REF: 061634aii NAT: F.BF.B.7 TOP: Series KEY: geometric

740 ANS:

$P(P/K) = \dfrac{P(P \wedge K)}{P(K)} = \dfrac{1.9}{2.3} \approx 82.6\%$ A key club member has an 82.6% probability of being enrolled in AP Physics.

REF: 011735aii NAT: S.CP.A.3 TOP: Conditional Probability

741 ANS:

$2x - 6 = 2\sqrt{x-1}$ 2 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

742 ANS:

$x^2 + (2x-5)^2 = 25$ $y + 5 = 2(0)$ $y + 5 = 2(4)$ $(0,-5),(4,3)$

$x^2 + 4x^2 - 20x + 25 = 25$ $y = -5$ $y = 3$

$5x^2 - 20x = 0$

$5x(x-4) = 0$

$x = 0, 4$

REF: 062236aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

743 ANS:

$\sqrt{6-2x} + x = 2x + 30 - 9$ $\sqrt{6-2(-29)} \neq -29 + 21$, so -29 is extraneous.

$\sqrt{6-2x} = x + 21$ $\sqrt{64} \neq -8$

$6 - 2x = x^2 + 42x + 441$

$x^2 + 44x + 435 = 0$

$(x+29)(x+15) = 0$

$x = -29, -15$

REF: 061833aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

744 ANS:

$$\frac{3p}{p-5} = \frac{p+2}{p+3}$$

$$3p^2 + 9p = p^2 - 3p - 10$$

$$2p^2 + 12p + 10 = 0$$

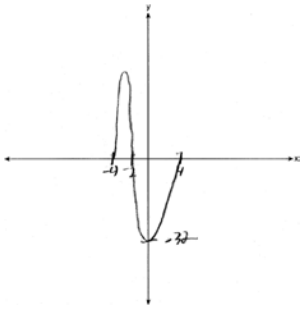
$$p^2 + 6p + 5 = 0$$

$$(p+5)(p+1) = 0$$

$$p = -5, -1$$

REF: 081733aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

745 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

746 ANS:

$\frac{1200}{1200+2016} \approx .373$. Yes, because $\frac{1600}{4288} \approx .373$ also.

REF: 062334aii NAT: S.CP.A.4 TOP: Conditional Probability

747 ANS:

China: $\frac{P(120) - P(50)}{120 - 50} \approx 13.5$ India: $\frac{1380 - 376.3}{120 - 50} \approx 14.3$ India

REF: 082433aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

748 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

749 ANS:
Yes. The margin of error from this simulation indicates that 95% of the observations fall within ± 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 ± 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.

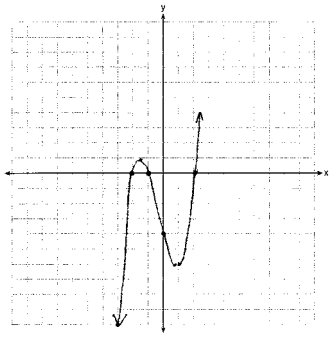
REF: spr1512aii NAT: S.IC.A.2 TOP: Analysis of Data

750 ANS:
$750 \mp 2(20)$ $50\% + 19.1\% \approx 69\%$

$710 - 790$

REF: 062534aii NAT: S.ID.A.4 TOP: Normal Distributions

751 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

752 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

753 ANS:

$s(t) = 200(0.5)^{\frac{t}{15}}$ $\frac{1}{10} = (0.5)^{\frac{t}{15}}$

$$\log\frac{1}{10} = \log(0.5)^{\frac{t}{15}}$$

$$-1 = \frac{t \cdot \log(0.5)}{15}$$

$$t = \frac{-15}{\log(0.5)} \approx 50$$

REF: 061934aii NAT: F.LE.A.4 TOP: Exponential Decay

754 ANS:

$$x-4\overline{)\,3x^3-4x^2+2x-1}\qquad \begin{array}{r} 3x^2+8x+34 \\ \underline{3x^3-12x^2} \\ 8x^2+2x \\ \underline{8x^2-32x} \\ 34x-1 \\ \underline{34x-136} \\ 135 \end{array}$$

$3x^2+8x+34+\frac{135}{x-4}$ $x = 4$ is not a root of $f(x)$ because $\frac{f(x)}{g(x)}$ has a remainder.

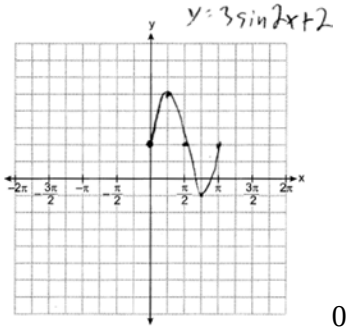
REF: 082235aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

755 ANS:

$\frac{3+42}{1500} = 3\%$ $\frac{3}{3+12} = 20\%$ 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

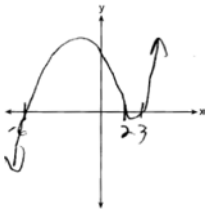
756 ANS:



$0 < x < \frac{\pi}{4}$

REF: 012436aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

757 ANS:



$p(x) = (x-2)(x-3)(x+6)$

REF: 062333aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

758 ANS:

$A(t) = 4000\left(1+\frac{2.4\%}{12}\right)^{12t}$ $B(t) = 3500\left(1+\frac{4\%}{4}\right)^{4t}$ 8.4, the value of t for which $A(t) = B(t)$

REF: 012435aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

759 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.A.2 TOP: Analysis of Data

760 ANS:

$\frac{6.25-2.25}{21-5} = \frac{4}{16} = \$.25$ fine per day. $2.25 - 5(.25) = \$1$ replacement fee. $a_n = 1.25 + (n-1)(.25)$. $a_{60} = \$16$

REF: 081734aii NAT: F.BF.A.2 TOP: Sequences KEY: explicit

761 ANS:

$\left(\sqrt{2x-7}\right)^2 = (5-x)^2$ $\sqrt{2(4)-7}+4=5$ $\sqrt{2(8)-7}+8=5$

$2x-7 = 25-10x+x^2$ $\sqrt{1}=1$ $\sqrt{9}\neq -3$

$0 = x^2-12x+32$

$0 = (x-8)(x-4)$

$x = 4, 8$

REF: 081635aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

762 ANS:

$\sqrt{49-10x} = 2x-5$ $-\frac{3}{2}$ 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

763 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: 062336aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

764 ANS:

$j(-1) = 2(-1)^4-(-1)^3-35(-1)^2+16(-1)+48 = 2+1-35-16+48 = 0$; $x+1$ is a factor of $j(x)$;

$2x^3-3x^2-32x+48 = 0$

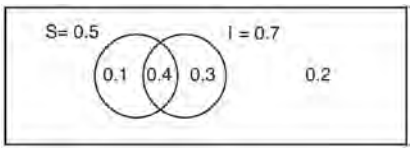
$x^2(2x-3)-16(2x-3) = 0$

$\left(x^2-16\right)(2x-3) = 0$

$x = \pm 4, \frac{3}{2}$

REF: 081834aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

765 ANS:

This scenario can be modeled with a Venn Diagram: 

Since $P(S \cup I)_c = 0.2$, $P(S \cup I) = 0.8$. 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

766 ANS:

No, because $f(-x) = 2^{-x}$ $g(x) = f(x) + 5$ $y = 2^x + 5$

$2^{-x} \neq 2^x$ $x = 2^y + 5$

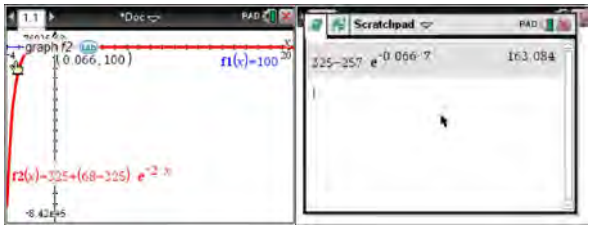
$$\log(x-5) = \log 2^y$$

$$\frac{\log(x-5)}{\log 2} = \frac{y \log 2}{\log 2}$$

$$\frac{\log(x-5)}{\log 2} = h(x)$$

REF: 082435aii NAT: F.BF.B.5 TOP: Inverse of Functions
KEY: exponential

767 ANS:



$100 = 325 + (68 - 325)e^{-2k}$ $T = 325 - 257e^{-0.066t}$

$-225 = -257e^{-2k}$ $T = 325 - 257e^{-0.066(7)} \approx 163$

$$k = \frac{\ln\left(\frac{-225}{-257}\right)}{-2}$$

$$k \approx 0.066$$

REF: fall1513aii NAT: F.LE.A.4 TOP: Exponential Growth

768 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: 061835aii NAT: F.LE.A.4 TOP: Exponential Growth

769 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: 061635aii NAT: S.IC.A.2 TOP: Analysis of Data

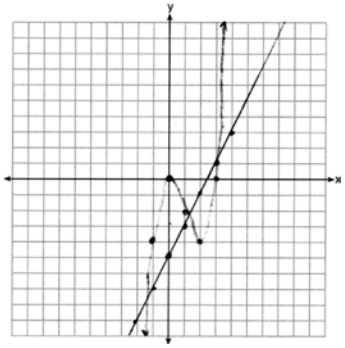
770 ANS:

$t = 2\pi\sqrt{\frac{67}{9.81}} \approx 16.4$ $9.6 = 2\pi\sqrt{\frac{L}{9.81}}$

$L \approx 22.9$

REF: 062234aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: context

771 ANS:



3

REF: 062233aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

772 ANS:

$(x-2)^2 + (-2x+7-3)^2 = 20$ $y = -2(0) + 7 = 7$ $(0,7),(4,-1)$

$(x-2)^2 + (-2x+4)^2 = 20$ $y = -2(4) + 7 = -1$

$x^2 - 4x + 4 + 4x^2 - 16x + 16 = 20$

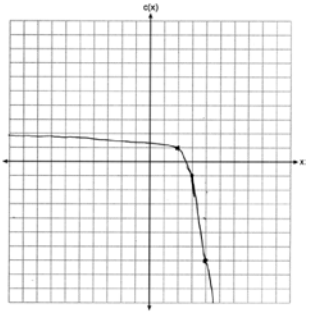
$5x^2 - 20x = 0$

$5x(x-4) = 0$

$x = 0, 4$

REF: 062335aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

773 ANS:



As $x \to \infty, c(x) \to -\infty$. As $x \to -\infty, c(x) \to 2$.

REF: 012335aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

774 ANS:

$f(x) = x^2(x+4)(x-3)$; $g(x) = (x+2)^2(x+6)(x-1)$

REF: 011836aii NAT: F.BF.B.3 TOP: Transformations with Functions

775 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: 081736aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

776 ANS:

$0.301 \pm 2(0.058) \to 0.185 - 0.417$ $\frac{14}{60} \approx 0.23$. It is not unusual because 0.23 falls within this interval.

REF: 081935aii NAT: S.IC.A.2 TOP: Analysis of Data

777 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: 061836aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

778 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, arithmetic

779 ANS:

$$\frac{2}{x} = \frac{2x+3}{x-4} \quad x = \frac{-1 \pm \sqrt{1^2 - 4(2)(8)}}{2(2)} = \frac{-1 \pm \sqrt{-63}}{4} = -\frac{1}{4} \pm \frac{3i\sqrt{7}}{4}$$

$$2x^2 + 3x = 2x - 8$$

$$2x^2 + x + 8 = 0$$

REF: 062533aii NAT: A.REI.A.2 TOP: Solving Rationals

780 ANS:

$$0 = 6(-5)^3 + b(-5)^2 - 52(-5) + 15 \quad z(x) = 6x^3 + 19x^2 - 52x + 15$$

$$0 = -750 + 25b + 260 + 15$$

$$475 = 25b$$

$$19 = b$$

-5	6	19	-52	15
		-30	55	15
	6	-11	3	0

$$6x^2 - 11x + 3 = 0$$

$$(2x-3)(3x-1) = 0$$

$$x = \frac{3}{2}, \frac{1}{3}, -5$$

REF: fall1515aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

781 ANS:

$16x^4 - 81 = \left(4x^2 + 9\right)\left(4x^2 - 9\right) = \left(4x^2 + 9\right)(2x+3)(2x-3)$. No, because $\pm\frac{3i}{2}$ are roots.

REF: 061933aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

782 ANS:

$$4(2x-1) - (5(x+1)^2 + 3(x+1) - 12)$$

$$8x - 4 - (5(x^2 + 2x + 1) + 3x + 3 - 12)$$

$$8x - 4 - (5x^2 + 10x + 5 + 3x - 9)$$

$$8x - 4 - (5x^2 + 13x - 4)$$

$$-5x^2 - 5x$$

REF: 082536aii NAT: F.BF.A.1 TOP: Operations with Functions

783 ANS:

$\frac{H(10) - H(2)}{10 - 2} \approx 11524$ From 2014-2018, the median house price increased \$11524 per year on average.

REF: 062434aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

784 ANS:
$.795 \pm 2 \cdot .085 = .625 - .965$. Yes, as it is plausible at least .625 of the customers will purchase both.

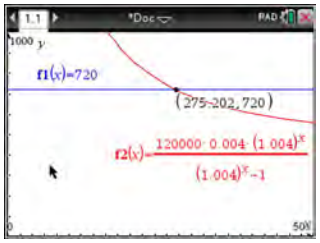
REF: 062435aii NAT: S.IC.A.2 TOP: Analysis of Data

785 ANS:

$$C_n = \frac{85000 - 85000(1.025)^n}{1 - 1.025} \quad C_{10} = \frac{85000 - 85000(1.025)^{10}}{1 - 1.025} \approx 952300$$

REF: 062536aii NAT: F.BF.B.7 TOP: Series KEY: geometric

786 ANS:



$$720 = \frac{120000\left(\frac{.048}{12}\right)\left(1 + \frac{.048}{12}\right)^n}{\left(1 + \frac{.048}{12}\right)^n - 1} \quad \frac{275.2}{12} \approx 23 \text{ years}$$

$$720(1.004)^n - 720 = 480(1.004)^n$$

$$240(1.004)^n = 720$$

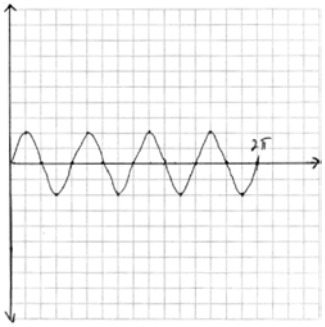
$$1.004^n = 3$$

$$n \log 1.004 = \log 3$$

$$n \approx 275.2 \text{ months}$$

REF: spr1509aii NAT: F.LE.A.4 TOP: Exponential Growth

787 ANS:



$y = 2\sin 4x$

REF: 081934aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

788 ANS:
$.651 \pm 2 \cdot .034 = .58 - .72$. No, since .61 (122/200) falls within the 95% interval.

REF: 062235aii NAT: S.IC.A.2 TOP: Analysis of Data

789 ANS:

$y = 9290.57(1.02)^x$ $\quad 15000 = 9290.57(1.02)^x$

$$\log \frac{15000}{9290.57} = \log 1.02^x$$

$$\log \frac{15000}{9290.57} = x \log 1.02$$

$$\frac{\log \frac{15000}{9290.57}}{\log 1.02} = x$$

$$24.2 = x$$

REF: 082533aii NAT: S.ID.B.6 TOP: Regression KEY: exponential

790 ANS:

$\frac{x-2}{(x-6)(x-2)} + \frac{x(x-6)}{(x-6)(x-2)} = \frac{4}{(x-6)(x-2)}$. 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

791 ANS:

$\left(2x^2 + x - 3\right) \bullet (x-1) - \left[\left(2x^2 + x - 3\right) + (x-1)\right]$

$\left(2x^3 - 2x^2 + x^2 - x - 3x + 3\right) - \left(2x^2 + 2x - 4\right)$

$2x^3 - 3x^2 - 6x + 7$

REF: 011833aii NAT: F.BF.A.1 TOP: Operations with Functions

792 ANS:

$20000 = PMT\left(\frac{1-(1+.00625)^{-60}}{0.00625}\right)$ $\quad 21000 - x = 300\left(\frac{1-(1+.00625)^{-60}}{0.00625}\right)$

$PMT \approx 400.76$ $\qquad x \approx 6028$

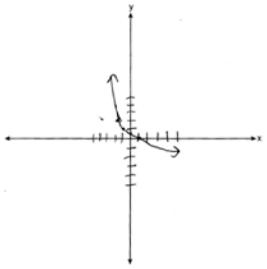
REF: 011736aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

793 ANS:

$.74 \cdot .24 = .1776$ $\quad .74 + .24 - .1776 = .8024$

REF: 012533aii NAT: S.CP.B.7 TOP: Addition Rule

794 ANS:



As $x \to -3, y \to \infty$. As $x \to \infty, y \to -\infty$..

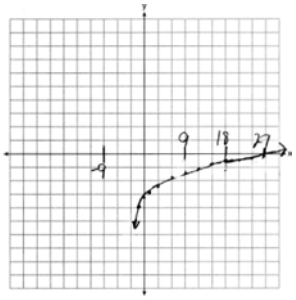
REF: 082333aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

795 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

796 ANS:



As $x \to -3, y \to -\infty$. As $x \to \infty, y \to \infty$.

REF: 061735aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

Algebra II 6 Point Regents Exam Questions
Answer Section

1 ANS:

$A(t) = 8000\left(1 + \frac{.042}{4}\right)^{4t}$ $A(18) = 16970.900$ $24000 = 8000e^{.039t}$

$B(t) = 8000e^{.039t}$ $B(18) = \underline{16142.274}$ $\ln 3 = \ln e^{.039t}$

828.63 $\ln 3 = .039t$

$t \approx 28.2$

REF: 082337aii NAT: F.LE.A.4 TOP: Exponential Growth

2 ANS:

$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}}$ $\log\frac{100}{140} = \log\left(\frac{1}{2}\right)^{\frac{5}{h}}$ $40 = 140\left(\frac{1}{2}\right)^{\frac{t}{10.3002}}$

$\log\frac{5}{7} = \frac{5}{h}\log\frac{1}{2}$ $\log\frac{2}{7} = \log\left(\frac{1}{2}\right)^{\frac{t}{10.3002}}$

$h = \frac{5\log\frac{1}{2}}{\log\frac{5}{7}} \approx 10.3002$ $\log\frac{2}{7} = \frac{t\log\left(\frac{1}{2}\right)}{10.3002}$

$t = \frac{10.3002\log\frac{2}{7}}{\log\frac{1}{2}} \approx 18.6$

REF: 061737aii NAT: F.LE.A.4 TOP: Exponential Decay

3 ANS:

$0 = \sqrt{t} - 2t + 6$ $2\left(\frac{9}{4}\right) - 6 < 0$, so $\frac{9}{4}$ is extraneous.

$2t - 6 = \sqrt{t}$

$4t^2 - 24t + 36 = t$

$4t^2 - 25t + 36 = 0$

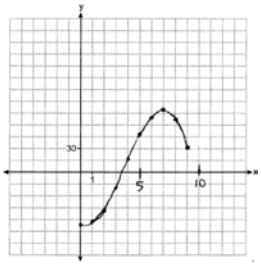
$(4t - 9)(t - 4) = 0$

$t = \frac{9}{4}, 4$

$(\sqrt{1} - 2(1) + 6) - (\sqrt{3} - 2(3) + 6) = 5 - \sqrt{3} \approx 3.268$ 327 mph

REF: 011737aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: context

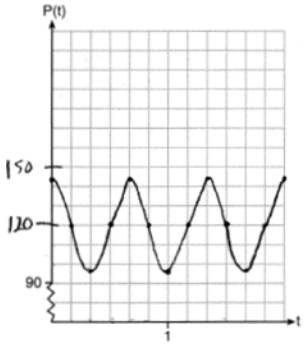
4 ANS:



(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

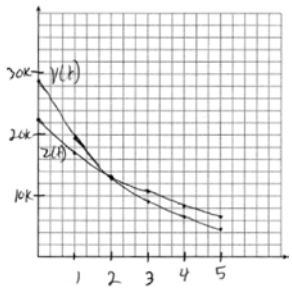
5 ANS:

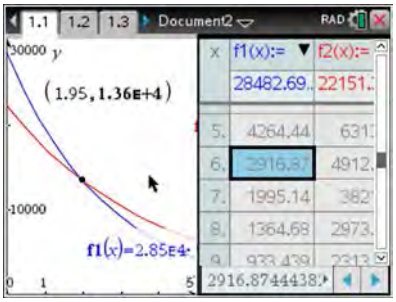


The period of P is $\frac{2}{3}$, which means the patient's blood pressure reaches a high every $\frac{2}{3}$ second and a low every $\frac{2}{3}$ second. The patient's blood pressure is high because 144 over 96 is greater than 120 over 80.

REF: 011837aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

6 ANS:

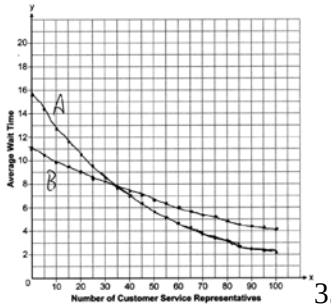




At 1.95 years, the value of the car equals the loan balance. Zach can cancel the policy after 6 years.

REF: 081737aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

7 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

8 ANS:

$A = 5000(1.045)^n$ $5000\left(1 + \frac{.046}{4}\right)^{4(6)} - 5000(1.045)^6 \approx 6578.87 - 6511.30 \approx 67.57$ $10000 = 5000\left(1 + \frac{.046}{4}\right)^{4n}$

$B = 5000\left(1 + \frac{.046}{4}\right)^{4n}$

$2 = 1.0115^{4n}$

$\log 2 = 4n \cdot \log 1.0115$

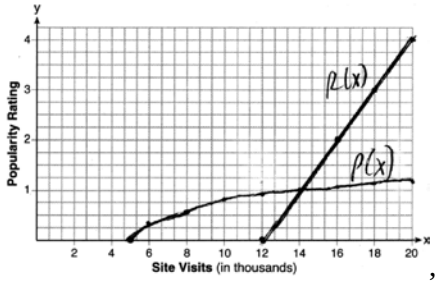
$n = \frac{\log 2}{4 \log 1.0115}$

$n \approx 15.2$

REF: 081637aii NAT: F.LE.A.4 TOP: Exponential Growth

9 ANS:

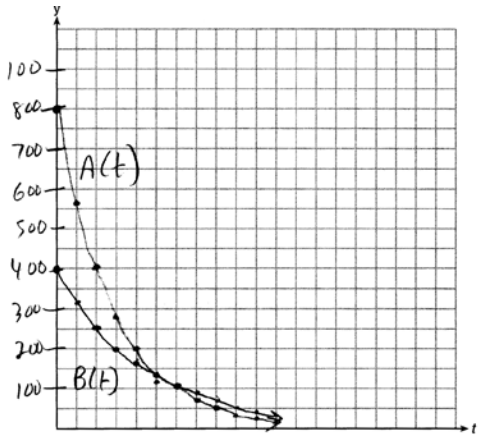
$P(16) = \log(16 - 4) \approx 1.1$,



, 14000

REF: 061837aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

10 ANS:



$A(t) = 800e^{-0.347t}$

$B(t) = 400e^{-0.231t}$

$800e^{-0.347t} = 400e^{-0.231t}$

$\ln 2e^{-0.347t} = \ln e^{-0.231t}$

$\ln 2 + \ln e^{-0.347t} = \ln e^{-0.231t}$

$\ln 2 - 0.347t = -0.231t$

$\ln 2 = 0.116t$

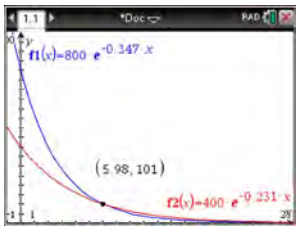
$6 \approx t$

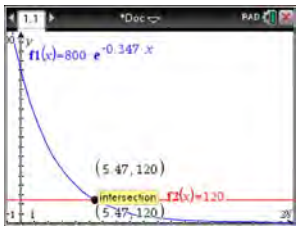
$0.15 = e^{-0.347t}$

$\ln 0.15 = \ln e^{-0.347t}$

$\ln 0.15 = -0.347t \cdot \ln e$

$5.5 \approx t$





REF: 061637aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

11 ANS:

$112 = 73 + (237 - 73)e^{-1.5k}$

$k \approx .958$

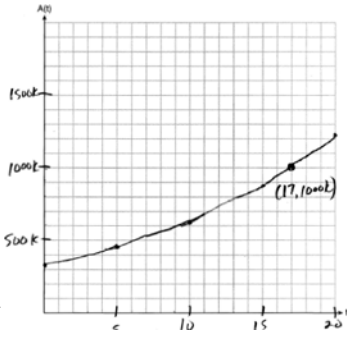
$T(2.5) = 73 + (237 - 73)e^{(-.958)(2.5)} \approx 88$

$80 = 73 + (237 - 73)e^{-.958t}$

$t \approx 3.3$

REF: 062437aii NAT: F.LE.A.4 TOP: Exponential Decay

12 ANS:



$A(t) = 318000(1.07)^t$ $318000(1.07)^t = 1000000$ The graph of $A(t)$ nearly intersects

$$1.07^t = \frac{1000}{318}$$

$$t \log 1.07 = \log \frac{1000}{318}$$

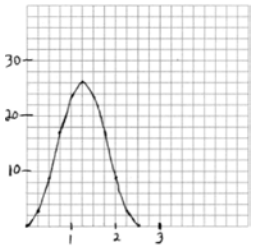
$$t = \frac{\log \frac{1000}{318}}{\log 1.07}$$

$$t \approx 17$$

the point $(17, 1000000)$.

REF: 011937aii NAT: F.LE.A.4 TOP: Exponential Growth

13 ANS:

period $= \frac{2\pi}{0.8\pi} = 2.5$. The wheel rotates once every 2.5 seconds. 

No, because the maximum of $f(t) = 26$.

REF: 061937aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

14 ANS:

1.5%; $P(t) = 92.2(1.015)^t$; $\dfrac{300}{92.2} = (1.015)^t$

$$\log\frac{300}{92.2} = t\log(1.015)$$

$$\frac{\log\frac{300}{92.2}}{\log(1.015)} = t$$

$$t \approx 79$$

REF: 062237aii NAT: F.BF.A.2 TOP: Sequences KEY: recursive, geometric

15 ANS:

antibiotic $n(0) = \dfrac{0+1}{0+5} + \dfrac{18}{0^2+8(0)+15} = \dfrac{3}{15} + \dfrac{18}{15} = \dfrac{21}{15}$ $\qquad \dfrac{t+1}{t+5} + \dfrac{18}{t^2+8t+15} = \dfrac{9}{t+3}$

$a(0) = \dfrac{9}{0+3} = 3$ $\qquad \dfrac{(t+1)(t+3)}{(t+5)(t+3)} + \dfrac{18}{(t+3)(t+5)} = \dfrac{9(t+5)}{(t+3)(t+5)}$

$$t^2 + 4t + 3 + 18 = 9t + 45$$

$$t^2 - 5t - 24 = 0$$

$$(t-8)(t+3) = 0$$

$$t = 8$$

REF: 012037aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

16 ANS:

$T = (400-75)e^{-0.0735t} + 75$, $325e^{-0.0735(5)} + 75 \approx 300$, $270 = (450-75)e^{-8r} + 75$, $325e^{-0.0735t} + 75 = 375e^{-0.0817t} + 75$

$r \approx 0.0817$ $\qquad t \approx 17$

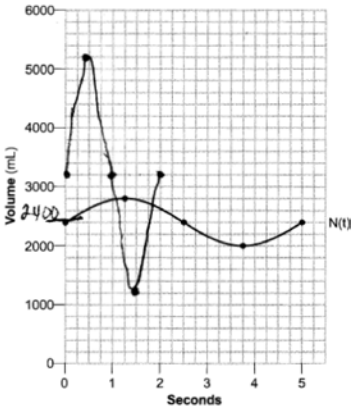
REF: 012337aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

17 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.
$\dfrac{A(10)-A(0)}{10-0} = \dfrac{89.58132-100}{10} = -1.041868$ 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

18 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

19 ANS:

$A(t) = 1200\left(1 + \frac{6.4\%}{4}\right)^{4t}$ Barnyard because $A(10) \approx 2264.28$ $B(10) = 2264.43$

$B(t) = 1200e^{6.35\%t}$

$3 = e^{6.35\%t}$

$\ln 3 = \ln e^{6.35\%t}$

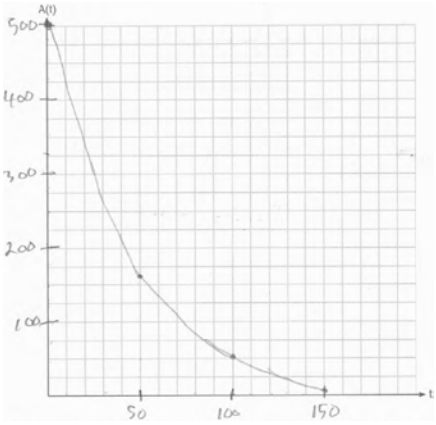
$\ln 3 = 0.635t$

$\frac{\ln 3}{0.635} = \frac{0.635t}{0.635}$

$t \approx 17.3$

REF: 082437aii NAT: F.LE.A.4 TOP: Exponential Growth

20 ANS:



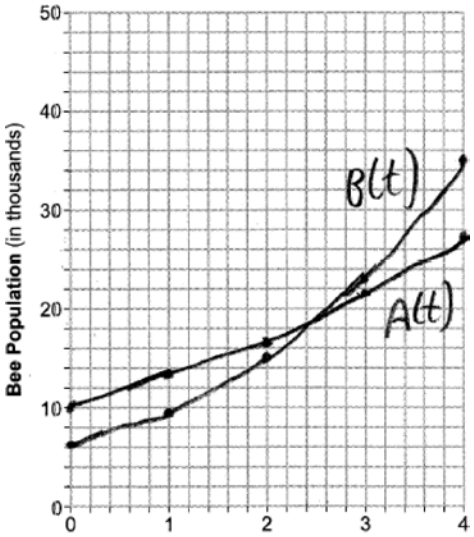
$125 = 500e^{k(60.34)}$ $A(t) = 500e^{-.023t}$ $\frac{A(60) - A(0)}{60 - 0} \approx -6.2$ The mass of

$k \approx -.023$

Cesium-137 decreases about 6.2 grams per year.

REF: 062537aii NAT: F.LE.A.4 TOP: Exponential Decay

21 ANS:



$A(t) = 10000e^{0.25t}$

$B(t) = 6000e^{0.45t}$

2.6 months for same. $30000 = 10000e^{0.25t}$

$\ln 3 = \ln e^{0.25t}$

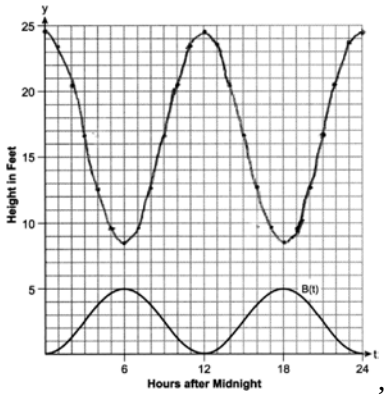
$\ln 3 = 0.25t \ln e$

$\frac{\ln 3}{0.25} = t$

$4.4 \approx t$

REF: 012537aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

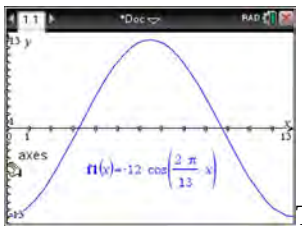
22 ANS:



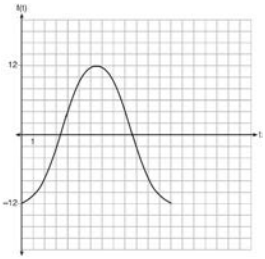
12, $B(t) = -2.5\cos\frac{\pi}{6}t + 2.5$, , 8.5

REF: 082537aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

23 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

24 ANS:

$B = 1.69\sqrt{30 + 4.45} - 3.49 \approx 6$, which is a steady breeze.

$15 = 1.69\sqrt{s + 4.45} - 3.49$

$18.49 = 1.69\sqrt{s + 4.45}$

$\frac{18.49}{1.69} = \sqrt{s + 4.45}$

$\left(\frac{18.49}{1.69}\right)^2 = s + 4.45$

$s = \left(\frac{18.49}{1.69}\right)^2 - 4.45$

$s \approx 115$

$9.5 = 1.69\sqrt{s + 4.45} - 3.49$

$12.99 = 1.69\sqrt{s + 4.45}$

$\frac{12.99}{1.69} = \sqrt{s + 4.45}$

$\left(\frac{12.99}{1.69}\right)^2 = s + 4.45$

$s = \left(\frac{12.99}{1.69}\right)^2 - 4.45$

$s \approx 55$

$10.49 = 1.69\sqrt{s + 4.45} - 3.49$ 55-64

$13.98 = 1.69\sqrt{s + 4.45}$

$\frac{13.98}{1.69} = \sqrt{s + 4.45}$

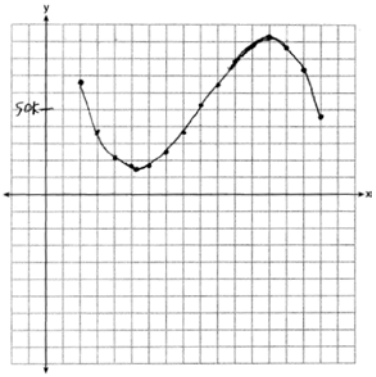
$\left(\frac{13.98}{1.69}\right)^2 = s + 4.45$

$s = \left(\frac{13.98}{1.69}\right)^2 - 4.45$

$s \approx 64$

REF: 081937aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: context

25 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