JMAP
REGENTS BY TYPE

The NY Algebra II Regents Exams Questions
from Spring 2015 to August 2018 Sorted by Type

Algebra II Multiple Choice Regents Exam Questions

1 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) $y^2 + 4$

2 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) $300e^{-0.42}$

3 For positive values of x, which expression is equivalent to $\sqrt{16x^2} \cdot x^{\frac{2}{3}} + \sqrt[3]{8x^5}$
1) $6\sqrt[3]{x^5}$
2) $6\sqrt[5]{x^3}$
3) $4\sqrt[3]{x^2} + 2\sqrt[3]{x^5}$
4) $4\sqrt{x^3} + 2\sqrt[5]{x^3}$

4 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) $\pm 2i, 2$

5 Which value is *not* contained in the solution of the system shown below?
$$a + 5b - c = -20$$
$$4a - 5b + 4c = 19$$
$$-a - 5b - 5c = 2$$
1) -2
2) 2
3) 3
4) -3

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

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

8 The expression $6xi^3(-4xi + 5)$ is equivalent to
1) $2x - 5i$
2) $-24x^2 - 30xi$
3) $-24x^2 + 30x - i$
4) $26x - 24x^2i - 5i$

1

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

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

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

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

10 The value(s) of x that satisfy $\sqrt{x^2 - 4x - 5} = 2x - 10$ are
1) $\{5\}$
2) $\{7\}$
3) $\{5,7\}$
4) $\{3,5,7\}$

11 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 $(b, 0)$.

12 The solution to the equation $4x^2 + 98 = 0$ is
1) ± 7
2) $\pm 7i$
3) $\pm \dfrac{7\sqrt{2}}{2}$
4) $\pm \dfrac{7i\sqrt{2}}{2}$

13 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) $\dfrac{255 + 93T}{3T} = 90$

2) $\dfrac{255 + 90T}{3T} = 93$

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

4) $\dfrac{255 + 90T}{T + 3} = 93$

14 The solutions to $x + 3 - \dfrac{4}{x - 1} = 5$ are

1) $\dfrac{3}{2} \pm \dfrac{\sqrt{17}}{2}$

2) $\dfrac{3}{2} \pm \dfrac{\sqrt{17}}{2} i$

3) $\dfrac{3}{2} \pm \dfrac{\sqrt{33}}{2}$

4) $\dfrac{3}{2} \pm \dfrac{\sqrt{33}}{2} i$

2

15 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

16 Which equation represents a parabola with a focus of $(0,4)$ and a directrix of $y = 2$?
1) $y = x^2 + 3$
2) $y = -x^2 + 1$
3) $y = \dfrac{x^2}{2} + 3$
4) $y = \dfrac{x^2}{4} + 3$

17 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) $j_1 = 250,000$

    $j_n = 1.00375 j_{n-1}$
4) $j_1 = 250,000$

    $j_n = j_{n-1} + 937$

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

19 The graph of $p(x)$ is shown below.
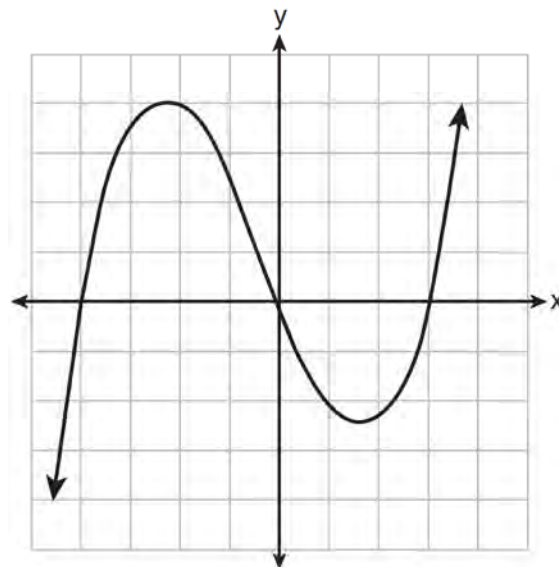
What is the remainder when $p(x)$ is divided by $x + 4$?
1) $x - 4$
2) -4
3) 0
4) 4

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

21 For the system shown below, what is the value of z?

$$y = -2x + 14$$
$$3x - 4z = 2$$
$$3x - y = 16$$

1) 5
2) 2
3) 6
4) 4

22 The expression $\dfrac{6x^3 + 17x^2 + 10x + 2}{2x + 3}$ equals

1) $3x^2 + 4x - 1 + \dfrac{5}{2x + 3}$

2) $6x^2 + 8x - 2 + \dfrac{5}{2x + 3}$

3) $6x^2 - x + 13 - \dfrac{37}{2x + 3}$

4) $3x^2 + 13x + \dfrac{49}{2} + \dfrac{151}{2x + 3}$

23 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.

24 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) $a_0 = 1000$

    $a_n = a_{n-1}(1.018) + 750n$
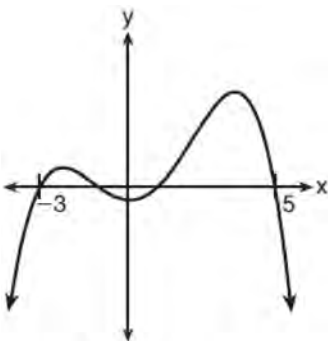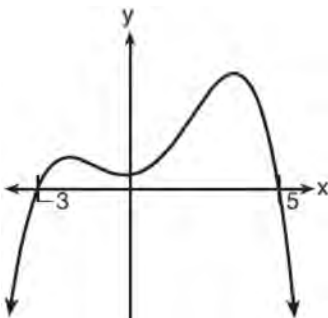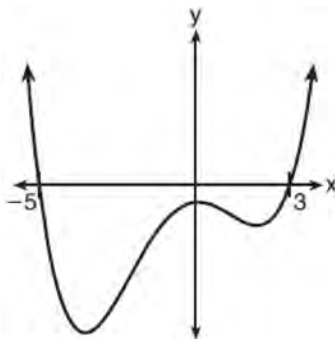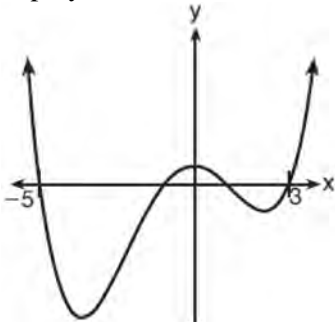
25 Judith puts $5000 into an investment account with interest compounded continuously. Which approximate annual rate is needed for the account to grow to $9110 after 30 years?
1) 2%
2) 2.2%
3) 0.02%
4) 0.022%

26 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)

27 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

28 A recursive formula for the sequence $18, 9, 4.5, \ldots$ is
1) $g_1 = 18$

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

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

3) $g_1 = 18$

   $g_n = 2 g_{n-1}$

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

29 The half-life of iodine-131 is 8 days. The percent of the isotope left in the body d days after being introduced is $I = 100 \left(\dfrac{1}{2} \right)^{\frac{d}{8}}$. When this equation is written in terms of the number e, the base of the natural logarithm, it is equivalent to $I = 100 e^{kd}$. What is the approximate value of the constant, k?
1) -0.087
2) 0.087
3) -11.542
4) 11.542

5

30 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)
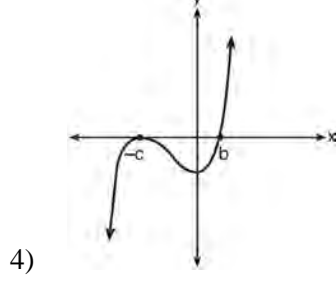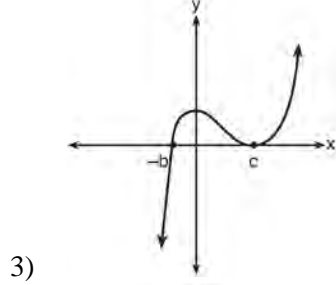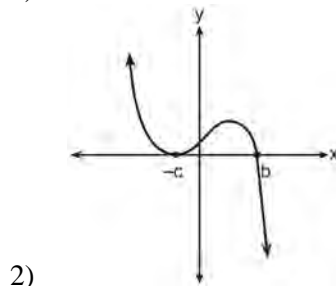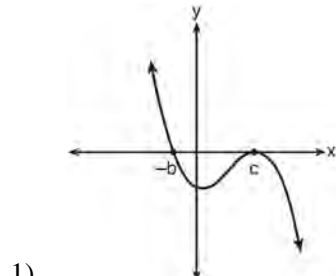
31 The equation $4x^2 - 24x + 4y^2 + 72y = 76$ is equivalent to

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) $4(x-3)^2 + 4(y+9)^2 = 436$

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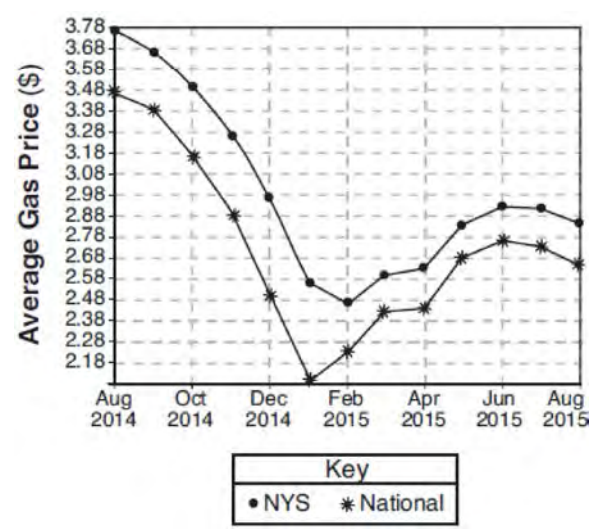
If New York State's gas prices are modeled by $G(x)$ and $C > 0$, which expression best approximates the national average x months from August 2014?

1) $G(x+C)$

2) $G(x) + C$

3) $G(x-C)$

4) $G(x) - C$

33 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

34 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

35 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) $\dfrac{m(c)}{g(c)} = \dfrac{-1}{1 - c}$

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

37 What is the inverse of $f(x) = -6(x - 2)$?
1) $f^{-1}(x) = -2 - \dfrac{x}{6}$
2) $f^{-1}(x) = 2 - \dfrac{x}{6}$
3) $f^{-1}(x) = \dfrac{1}{-6(x - 2)}$
4) $f^{-1}(x) = 6(x + 2)$

38 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

7

39 Which equation is represented by the graph shown below?
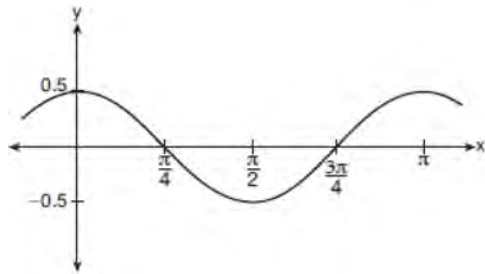
1) $y = \frac{1}{2}\cos 2x$

2) $y = \cos x$

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

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

40 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) $6 \pm 2\sqrt{19}$

41 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

42 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) $\{0, 3, -4\}$

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

44 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 $g(x)$.

45 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

46 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.
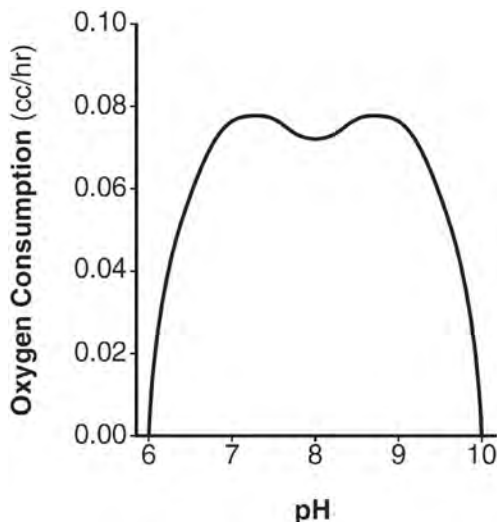
Which statement about this function is *incorrect*?
1) The degree of the polynomial is even.
2) There is a positive leading coefficient.
3) At two pH values, there is a relative maximum value.
4) There are two intervals where the function is decreasing.

47 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) $-\frac{4}{5}$

48 For all values of x for which the expression is defined, $\dfrac{x^3 + 2x^2 - 9x - 18}{x^3 - x^2 - 6x}$, in simplest form, is equivalent to
1) 3
2) $-\dfrac{17}{2}$
3) $\dfrac{x+3}{x}$
4) $\dfrac{x^2 - 9}{x(x-3)}$

49 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) $(11.29, 32.87)$

50 What is the solution, if any, of the equation $\dfrac{2}{x+3} - \dfrac{3}{4-x} = \dfrac{2x-2}{x^2 - x - 12}$?
1) -1
2) -5
3) all real numbers
4) no real solution

51 If $\sin^2(32°) + \cos^2(M) = 1$, then M equals
1) 32°
2) 58°
3) 68°
4) 72°

9

52 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?
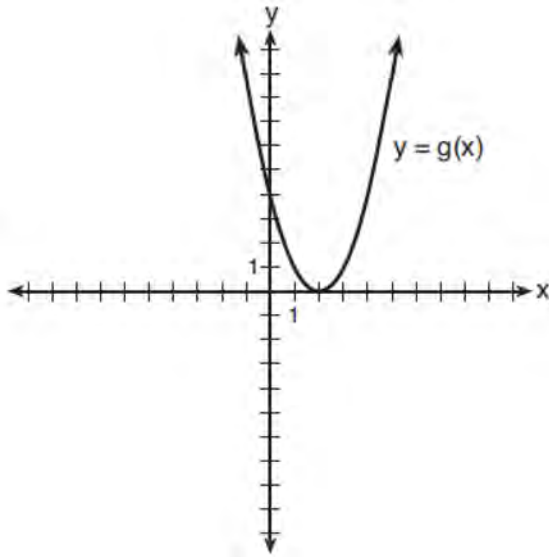
1) $\{(0,-2)\}$
2) $\{(0,-2),(1,6)\}$
3) $\{(1,6)\}$
4) $\{(1,1),(6,16)\}$

53 The terminal side of θ, an angle in standard position, intersects the unit circle at $P\left(-\dfrac{1}{3}, -\dfrac{\sqrt{8}}{3}\right)$.

What is the value of $\sec\theta$?
1) -3
2) $-\dfrac{3\sqrt{8}}{8}$
3) $-\dfrac{1}{3}$
4) $-\dfrac{\sqrt{8}}{3}$

54 What is the solution set of the equation $\dfrac{3x+25}{x+7} - 5 = \dfrac{3}{x}$?

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

55 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

56 When $g(x) = \dfrac{2}{x+2}$ 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) $(1.4, 3.4)$

10

57 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

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

59 What is the equation of the directrix for the parabola $-8(y-3) = (x+4)^2$?
1) $y = 5$
2) $y = 1$
3) $y = -2$
4) $y = -6$

60 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) $(x^2-4)^2 - 5(x^2-4) - 6 = (x^2-7)(x^2-6)$

61 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.
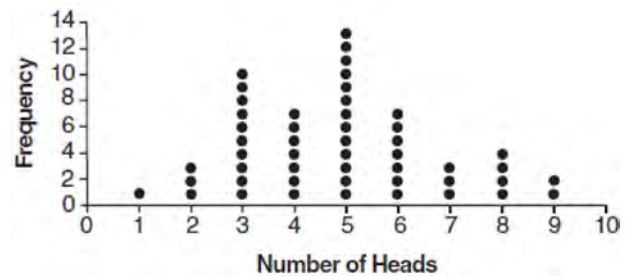
Based on the results of the simulation, which statement is *false*?
1) Five heads occurred most often, which is consistent with the theoretical probability of obtaining a heads.
2) Eight heads is unusual, as it falls outside the middle 95% of the data.
3) Obtaining three heads or fewer occurred 28% of the time.
4) Seven heads is not unusual, as it falls within the middle 95% of the data.

62 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

11

63 Which diagram represents an angle, α, measuring $\dfrac{13\pi}{20}$ radians drawn in standard position, and its reference angle, θ?
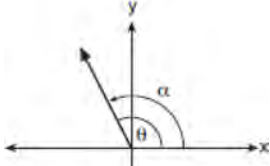
1)

2)
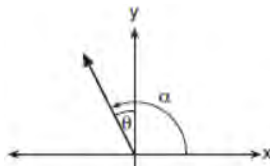
3)
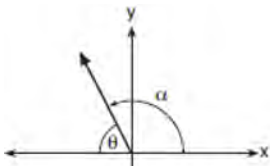
4)

64 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

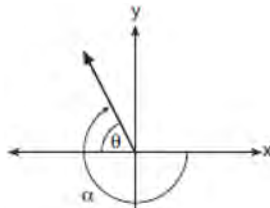65 The focal length, F, of a camera's lens is related to the distance of the object from the lens, J, and the distance to the image area in the camera, W, by the formula below.

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

When this equation is solved for J in terms of F and W, J equals
1) $F - W$
2) $\dfrac{FW}{F-W}$
3) $\dfrac{FW}{W-F}$
4) $\dfrac{1}{F} - \dfrac{1}{W}$

66 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) $(300, 400)$

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

68 A scatterplot showing the weight, w, in grams, of each crystal after growing t hours is shown below.
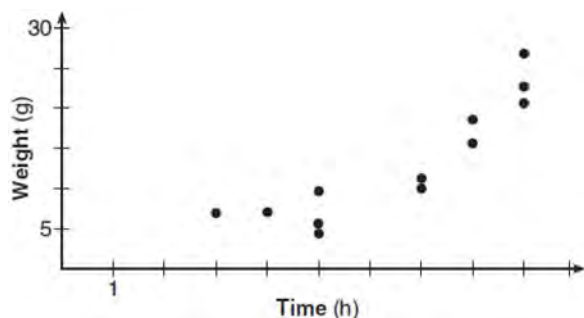
The relationship between weight, w, and time, t, is best modeled by

1) $w = 4^t + 5$

2) $w = (1.4)^t + 2$

3) $w = 5(2.1)^t$

4) $w = 8(.75)^t$

69 Which function represents exponential decay?

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

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

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

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

70 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

71 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.

72 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) $(3,0)$

73 The expression $\dfrac{-3x^2 - 5x + 2}{x^3 + 2x^2}$ can be rewritten as

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

2) $\dfrac{-3x - 1}{x^2}$

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

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

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

75 The graph of the function $p(x)$ is sketched below.
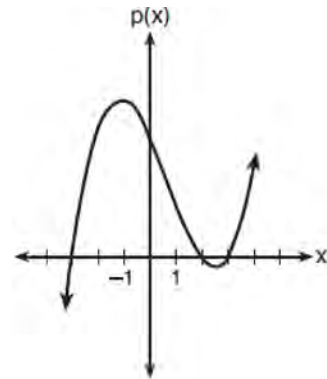
Which equation could represent $p(x)$?
1) $p(x) = (x^2 - 9)(x - 2)$
2) $p(x) = x^3 - 2x^2 + 9x + 18$
3) $p(x) = (x^2 + 9)(x - 2)$
4) $p(x) = x^3 + 2x^2 - 9x - 18$

76 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

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

78 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) $C(n) = \dfrac{329.99 + 326.34n}{n}$

79 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.

80 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.

81 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) $a_0 = 75,000$
   $a_n = 0.92(a_{n-1})$

82 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

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

84 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) $f(x) \div g(x)$

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

86 Which expression is equivalent to $\dfrac{2x^4 + 8x^3 - 25x^2 - 6x + 14}{x + 6}$?
1) $2x^3 + 4x^2 + x - 12 + \dfrac{86}{x + 6}$
2) $2x^3 - 4x^2 - x + 14$
3) $2x^3 - 4x^2 - x + \dfrac{14}{x + 6}$
4) $2x^3 - 4x^2 - x$

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

88 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.
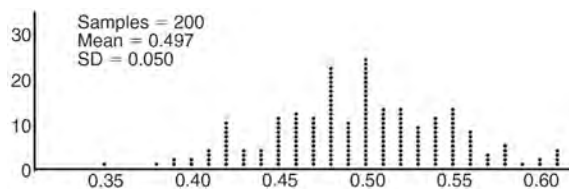
Given the results of her coin flips and of her computer simulation, which statement is most accurate?
1) 73 of the computer's next 100 coin flips will be heads.
2) 50 of her next 100 coin flips will be heads.
3) Her coin is not fair.
4) Her coin is fair.

89 For $x > 0$, which expression is equivalent to $\dfrac{\sqrt[3]{x^2} \bullet \sqrt{x^5}}{\sqrt[6]{x}}$?
1) x
2) $x^{\frac{3}{2}}$
3) x^3
4) x^{10}

16

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

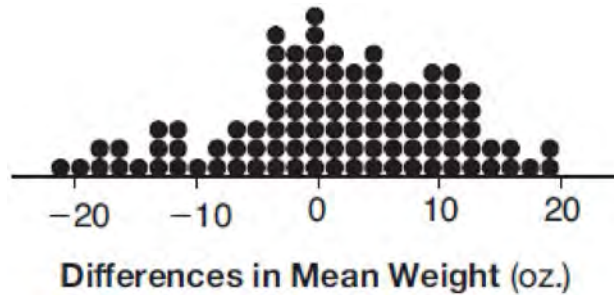**Differences in Mean Weight (oz.)**

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

1) There was no effect observed between the two groups.

2) There was an effect observed that could be due to the random assignment of plants to the groups.

3) There is strong evidence to support the hypothesis that tomatoes from plants planted in black plastic mulch are larger than those planted without mulch.

4) There is strong evidence to support the hypothesis that tomatoes from plants planted without mulch are larger than those planted in black plastic mulch.

91 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) $y = 2.5 - 2.5\left(2.7^{-2}\right)\left(2.7^{.05x}\right)$

92 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) $-\dfrac{3}{5}$

2) $-\dfrac{3}{4}$

3) $\dfrac{3}{5}$

4) $\dfrac{4}{5}$

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

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

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

3) $\dfrac{2}{3} \pm 6i\sqrt{158}$

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

94 Which equation represents a parabola with a focus of $(-2,5)$ and a directrix of $y = 9$?

1) $(y-7)^2 = 8(x+2)$
2) $(y-7)^2 = -8(x+2)$
3) $(x+2)^2 = 8(y-7)$
4) $(x+2)^2 = -8(y-7)$

95 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.

96 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%

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

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

98 Which statement is true about the graph of $f(x) = \left(\dfrac{1}{8}\right)^x$?

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, $x = 0$.

99 Which equation represents an odd function?

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

18

100 Which graph has the following characteristics?
   - three real zeros
   - as $x \to -\infty$, $f(x) \to -\infty$
   - as $x \to \infty$, $f(x) \to \infty$
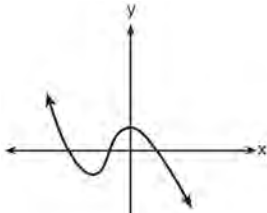
1)
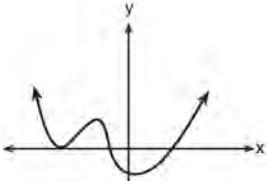
2)
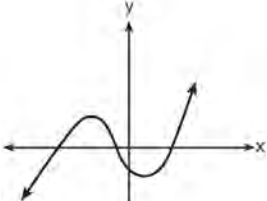
3)
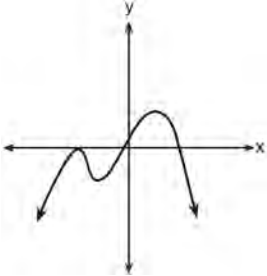
4)

101 Data for the students enrolled in a local high school are shown in the Venn diagram below.
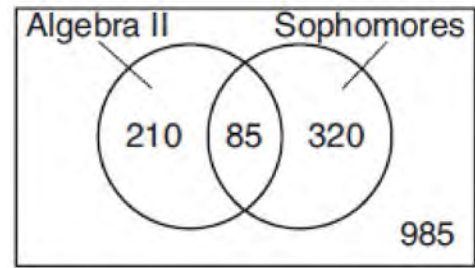
If a student from the high school is selected at random, what is the probability that the student is a sophomore given that the student is enrolled in Algebra II?

1) $\dfrac{85}{210}$

2) $\dfrac{85}{295}$

3) $\dfrac{85}{405}$

4) $\dfrac{85}{1600}$

102 Given $\cos\theta = \dfrac{7}{25}$, 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) $-\dfrac{24}{25}$

2) $-\dfrac{24}{7}$

3) $\dfrac{24}{25}$

4) $\dfrac{24}{7}$

103 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.
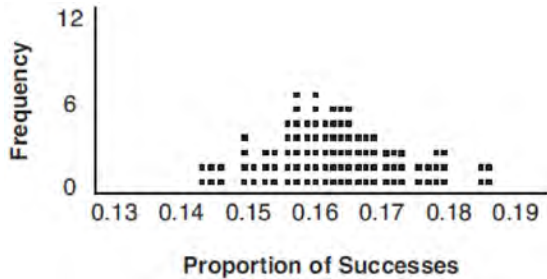
At a 95% confidence level, the proportion of New York City residents with hypertension and the margin of error are closest to
1) proportion $\approx .16$; margin of error $\approx .01$
2) proportion $\approx .16$; margin of error $\approx .02$
3) proportion $\approx .01$; margin of error $\approx .16$
4) proportion $\approx .02$; margin of error $\approx .16$

104 Which expression is equivalent to $\dfrac{4x^3 + 9x - 5}{2x - 1}$, where $x \neq \dfrac{1}{2}$?

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

105 Given the following polynomials
$$x = (a + b + c)^2$$
$$y = a^2 + b^2 + c^2$$
$$z = ab + bc + ac$$
Which identity is true?
1) $x = y - z$
2) $x = y + z$
3) $x = y - 2z$
4) $x = y + 2z$

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

20

107 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 $d = 10\log\dfrac{I}{I_0}$. 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

108 lridium-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 $A = 100\left(\dfrac{1}{2}\right)^{\frac{t}{73.83}}$. Which equation approximates the amount of Iridium-192 present after t days?

1) $A = 100\left(\dfrac{73.83}{2}\right)^t$

2) $A = 100\left(\dfrac{1}{147.66}\right)^t$

3) $A = 100(0.990656)^t$

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

109 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) $\displaystyle\sum_{n=1}^{6} 8(1.10)^{n-1}$

2) $\displaystyle\sum_{n=1}^{6} 8(1.10)^{n}$

3) $\dfrac{8 - 8(1.10)^6}{0.90}$

4) $\dfrac{8 - 8(0.10)^n}{1.10}$

110 What is the solution set of the equation
$\dfrac{2}{x} - \dfrac{3x}{x+3} = \dfrac{x}{x+3}$?

1) $\{3\}$

2) $\left\{\dfrac{3}{2}\right\}$

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

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

111 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) $-0.15x^3 + 32x + 120$

112 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) $y = -4\cos\left(\dfrac{\pi}{4}x\right) - 3$

2) $y = -4\cos\left(\dfrac{\pi}{4}x\right) + 5$

3) $y = -4\cos(8x) - 3$

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

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

114 The parabola described by the equation $y = \dfrac{1}{12}(x-2)^2 + 2$ has the directrix at $y = -1$. The focus of the parabola is

1) $(2,-1)$

2) $(2,2)$

3) $(2,3)$

4) $(2,5)$

115 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) $S = \dfrac{100 - 100(1.0025)^{12}}{1 - 1.0025}$

3) $S = 100(1.0025)^{12}$

4) $S = \dfrac{100 - 100(1.03)^{12}}{1 - 1.03}$

116 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) $(x^3y^2 + 3)(x^3y^2 - 3)(x^2 + 4)(x^2 - 4)$

117 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

118 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) $x - 7$

119 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) $29,400\left(1.068^{\frac{1}{365}}\right)^{365t}$

120 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 $y = -4$.

121 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

122 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

123 A certain pain reliever is taken in 220 mg dosages and has a half-life of 12 hours. The function

$A = 220\left(\dfrac{1}{2}\right)^{\frac{t}{12}}$ 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.

124 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) $[1,30]$

125 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

126 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) $300(1.30)^{\frac{365}{14}}$

127 What is the solution to $8(2^{x+3}) = 48$?
1) $x = \dfrac{\ln 6}{\ln 2} - 3$
2) $x = 0$
3) $x = \dfrac{\ln 48}{\ln 16} - 3$
4) $x = \ln 4 - 3$

128 If $ae^{bt} = c$, where a, b, and c are positive, then t equals
1) $\ln\left(\dfrac{c}{ab}\right)$
2) $\ln\left(\dfrac{cb}{a}\right)$
3) $\dfrac{\ln\left(\dfrac{c}{a}\right)}{b}$
4) $\dfrac{\ln\left(\dfrac{c}{a}\right)}{\ln b}$

129 Given that $\sin^2 \theta + \cos^2 \theta = 1$ and $\sin \theta = -\dfrac{\sqrt{2}}{5}$,

what is a possible value of $\cos \theta$?

1) $\dfrac{5 + \sqrt{2}}{5}$

2) $\dfrac{\sqrt{23}}{5}$

3) $\dfrac{3\sqrt{3}}{5}$

4) $\dfrac{\sqrt{35}}{5}$

130 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

131 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

132 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) $5x^2 + x - 3$

133 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) $-19 + 27i$

134 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

135 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

25

136 Functions f, g, and h are given below.

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

$$g(x) = f(x) + 1$$
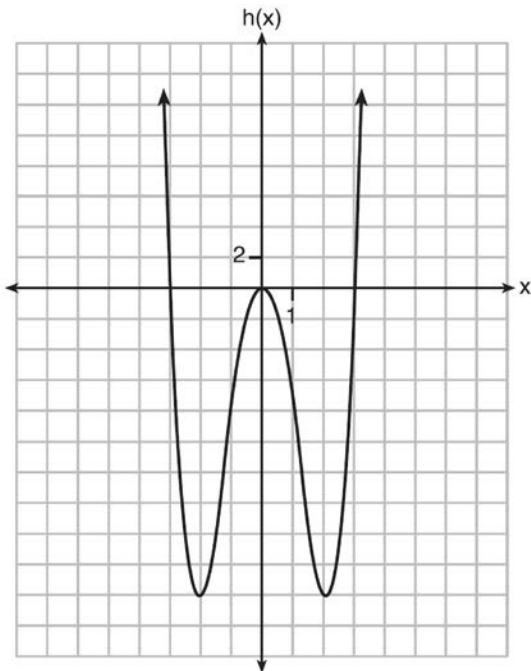
Which statement is true about functions f, g, and h?
1) $f(x)$ and $g(x)$ are odd, $h(x)$ is even.
2) $f(x)$ and $g(x)$ are even, $h(x)$ is odd.
3) $f(x)$ is odd, $g(x)$ is neither, $h(x)$ is even.
4) $f(x)$ is even, $g(x)$ is neither, $h(x)$ is odd.

137 The expression $\dfrac{x^3 + 2x^2 + x + 6}{x + 2}$ is equivalent to

1) $x^2 + 3$

2) $x^2 + 1 + \dfrac{4}{x + 2}$

3) $2x^2 + x + 6$

4) $2x^2 + 1 + \dfrac{4}{x + 2}$

138 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

139 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) $x = 3^y$

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

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

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

3) $\dfrac{9x^6 \sqrt[3]{4}}{y \sqrt[3]{y}}$

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

26

141 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.

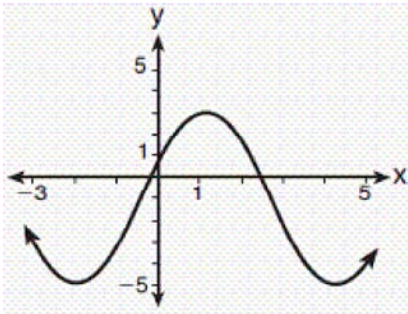| m	B
0	100.00
10	1172.00
19	1352.00
36	1770.80
60	2591.90
69	2990.00
72	3135.80
73	3186.00

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

142 Which sinusoid has the greatest amplitude?
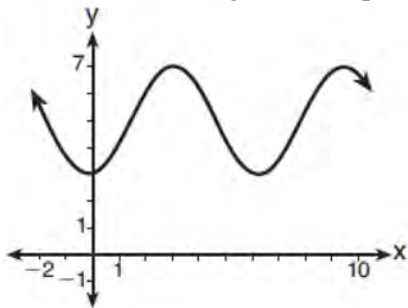
1)
2) $y = 3\sin(\theta - 3) + 5$

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

143 The solution set for the equation $\sqrt{56 - x} = x$ is
1) $\{-8, 7\}$
2) $\{-7, 8\}$
3) $\{7\}$
4) $\{\ \}$

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

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

1) $y = 8(x + 1)^2$

2) $y = \dfrac{1}{8}(x + 1)^2$

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

4) $y = \dfrac{1}{8}(x - 1)^2$

146 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

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

  I $\quad (m + p)^2 = m^2 + 2mp + p^2$

  II $\quad (x + y)^3 = x^3 + 3xy + y^3$

  III $\quad (a^2 + b^2)^2 = (a^2 - b^2)^2 + (2ab)^2$

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

148 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 $\dfrac{1}{6}$.

The output of the simulation is shown in the diagram below.
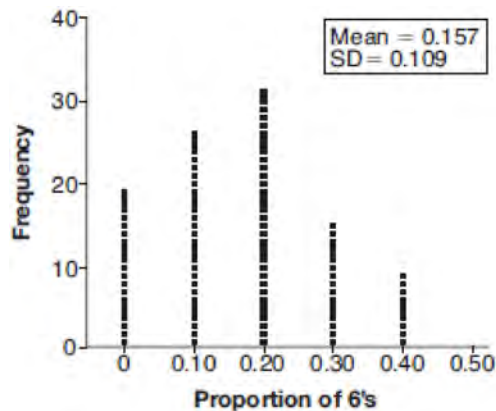
Which explanation is appropriate for Miles and his dad to make?

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.

149 Consider the function $p(x) = 3x^3 + x^2 - 5x$ and the graph of $y = m(x)$ below.
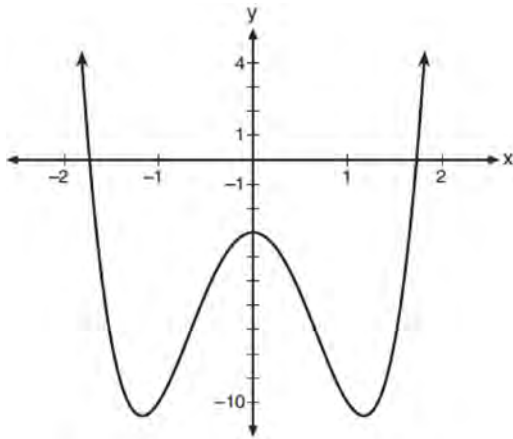
Which statement is true?
1) $p(x)$ has three real roots and $m(x)$ has two real roots.
2) $p(x)$ has one real root and $m(x)$ has two real roots.
3) $p(x)$ has two real roots and $m(x)$ has three real roots.
4) $p(x)$ has three real roots and $m(x)$ has four real roots.

150 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) $a_1 = 25,000, a_n = a_{n+1} + 1000$

151 Which equation represents the set of points equidistant from line ℓ and point R shown on the graph below?
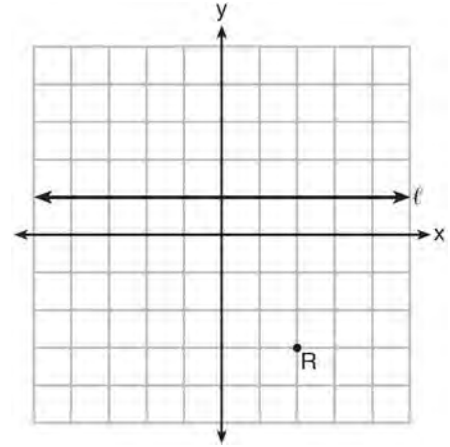
1) $y = -\frac{1}{8}(x+2)^2 + 1$

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

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

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

152 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.

153 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

29

154 When $b > 0$ and d is a positive integer, the expression $(3b)^{\frac{2}{d}}$ is equivalent to

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

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

3) $\dfrac{1}{\sqrt{3b^d}}$

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

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

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

157 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.
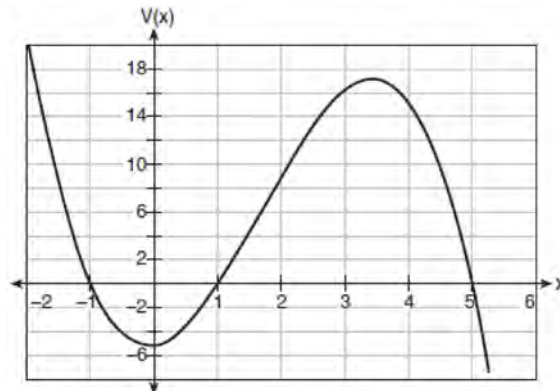
Over which interval is the volume of the box changing at the fastest average rate?
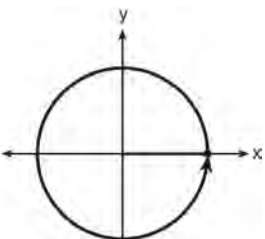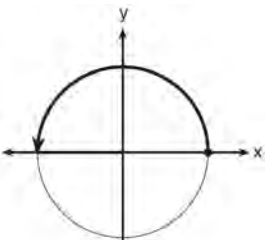1) $[1,2]$
2) $[1,3.5]$
3) $[1,5]$
4) $[0,3.5]$

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

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

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

3) $-m\sqrt[5]{m}$

4) $\dfrac{1}{m\sqrt[5]{m}}$

30

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

1)

2)

3)

4)
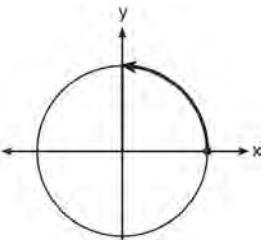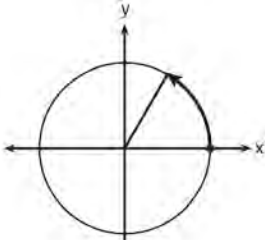
160 Which expression is equivalent to $(3k - 2i)^2$, where i is the imaginary unit?
1) $9k^2 - 4$
2) $9k^2 + 4$
3) $9k^2 - 12ki - 4$
4) $9k^2 - 12ki + 4$

161 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

162 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) $-3x^2 - 6xi - 18$

163 The inverse of the function $f(x) = \dfrac{x+1}{x-2}$ is
1) $f^{-1}(x) = \dfrac{x+1}{x+2}$
2) $f^{-1}(x) = \dfrac{2x+1}{x-1}$
3) $f^{-1}(x) = \dfrac{x+1}{x-2}$
4) $f^{-1}(x) = \dfrac{x-1}{x+1}$

31

164 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

165 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

166 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

167 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) $ac(bd)^{x^2}$

168 The expression $\dfrac{4x^3 + 5x + 10}{2x + 3}$ is equivalent to
1) $2x^2 + 3x - 7 + \dfrac{31}{2x + 3}$
2) $2x^2 - 3x + 7 - \dfrac{11}{2x + 3}$
3) $2x^2 + 2.5x + 5 + \dfrac{15}{2x + 3}$
4) $2x^2 - 2.5x - 5 - \dfrac{20}{2x + 3}$

169 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

170 The solution of $87e^{0.3x} = 5918$, to the *nearest thousandth*, is
1) 0.583
2) 1.945
3) 4.220
4) 14.066

171 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.

172 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

173 Given $f(9) = -2$, which function can be used to generate the sequence $-8, -7.25, -6.5, -5.75, \ldots$?
1) $f(n) = -8 + 0.75n$
2) $f(n) = -8 - 0.75(n - 1)$
3) $f(n) = -8.75 + 0.75n$
4) $f(n) = -0.75 + 8(n - 1)$

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

1)

2)

3)

4)
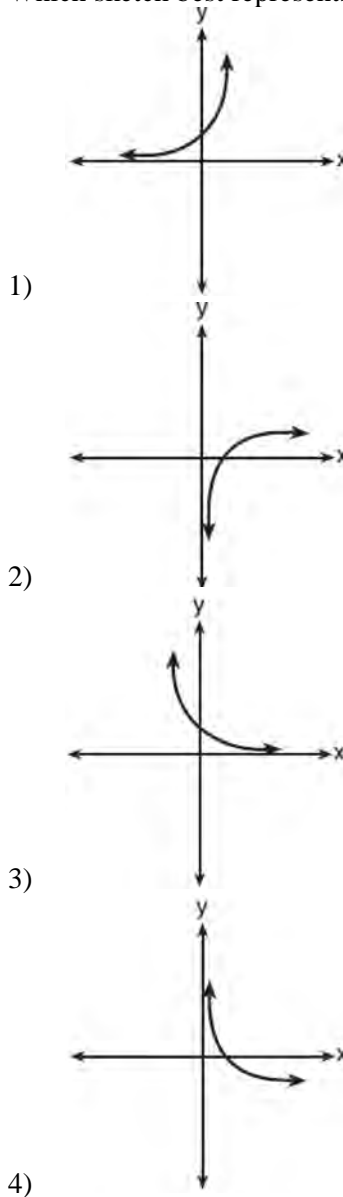
175 The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height, H, in feet, above the ground of one of the six-person cars can be modeled by

$H(t) = 70\sin\left(\dfrac{2\pi}{7}(t - 1.75)\right) + 80$, 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

176 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

177 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 solution.
3) 0 and 2 are extraneous solutions.
4) This equation does not contain any extraneous solutions.

178 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.

Age Group	Text Messages per Month		
	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) $\dfrac{157}{229}$
2) $\dfrac{157}{312}$
3) $\dfrac{157}{384}$
4) $\dfrac{157}{456}$

179 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

180 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 $-i$

181 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) $t = 11$

182 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.

183 The roots of the equation $3x^2 + 2x = -7$ are

1) $-2, -\dfrac{1}{3}$

2) $-\dfrac{7}{3}, 1$

3) $-\dfrac{1}{3} \pm \dfrac{2i\sqrt{5}}{3}$

4) $-\dfrac{1}{3} \pm \dfrac{\sqrt{11}}{3}$

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

Price of a Postage Stamp Since End of World War I

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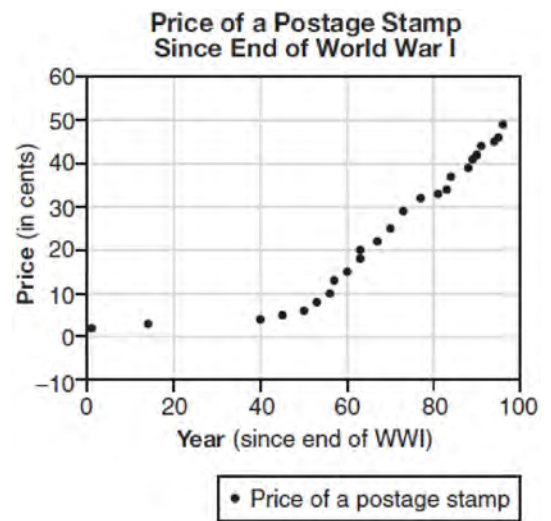
The equation that best models the price, in cents, of a postage stamp based on these data is

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

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

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

1) $f(x) = \dfrac{4}{3}x - \dfrac{8}{3}$

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

3) $f(x) = \dfrac{3}{4}x - 2$

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

187 Which equation represents a parabola with the focus at $(0,-1)$ and the directrix of $y = 1$?
1) $x^2 = -8y$
2) $x^2 = -4y$
3) $x^2 = 8y$
4) $x^2 = 4y$

188 What is the solution set for x in the equation below?
$$\sqrt{x+1} - 1 = x$$
1) $\{1\}$
2) $\{0\}$
3) $\{-1,0\}$
4) $\{0,1\}$

189 The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.
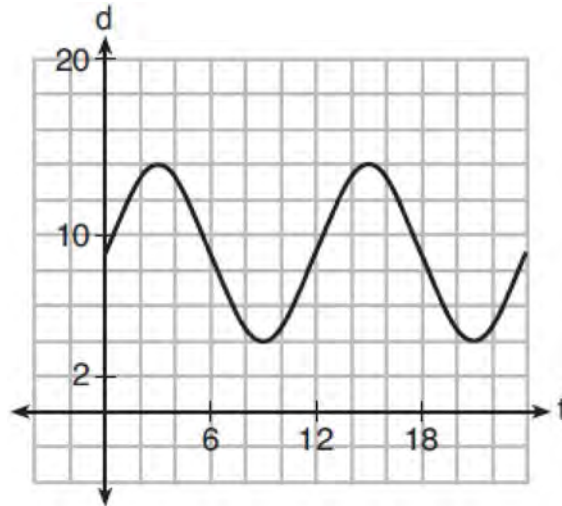
If the depth, d, is measured in feet and time, t, is measured in hours since midnight, what is an equation for the depth of the water at the marker?

1) $d = 5\cos\left(\dfrac{\pi}{6}t\right) + 9$

2) $d = 9\cos\left(\dfrac{\pi}{6}t\right) + 5$

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

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

190 The expression $(x + a)(x + b)$ can *not* be written as
1) $a(x + b) + x(x + b)$
2) $x^2 + abx + ab$
3) $x^2 + (a + b)x + ab$
4) $x(x + a) + b(x + a)$

191 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

192 Written in simplest form, $\dfrac{c^2 - d^2}{d^2 + cd - 2c^2}$ where $c \neq d$, is equivalent to

1) $\dfrac{c + d}{d + 2c}$

2) $\dfrac{c - d}{d + 2c}$

3) $\dfrac{-c - d}{d + 2c}$

4) $\dfrac{-c + d}{d + 2c}$

193 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) $\dfrac{16x + y}{124}$

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

195 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

196 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) $(-2, -1)$

37

197 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) $(1.00427)^{\frac{m}{12}}$

198 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 $-1 - 4i$

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

200 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) $2d(d - 3)^2(d + 3)$

201 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

202 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.
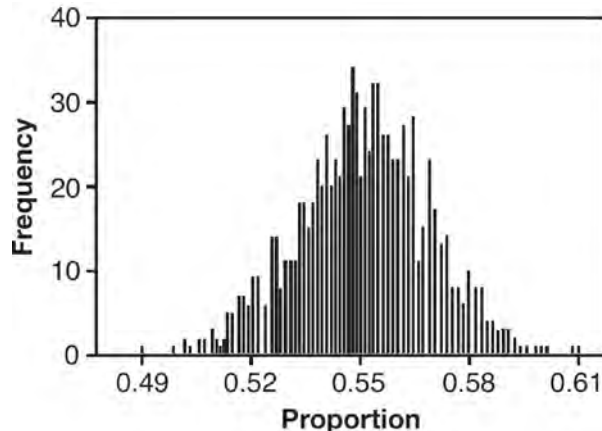
Given this output, and assuming a 95% confidence level, the margin of error for the poll is closest to
1) 0.01
2) 0.03
3) 0.06
4) 0.12

Algebra II 2 Point Regents Exam Questions

203 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.
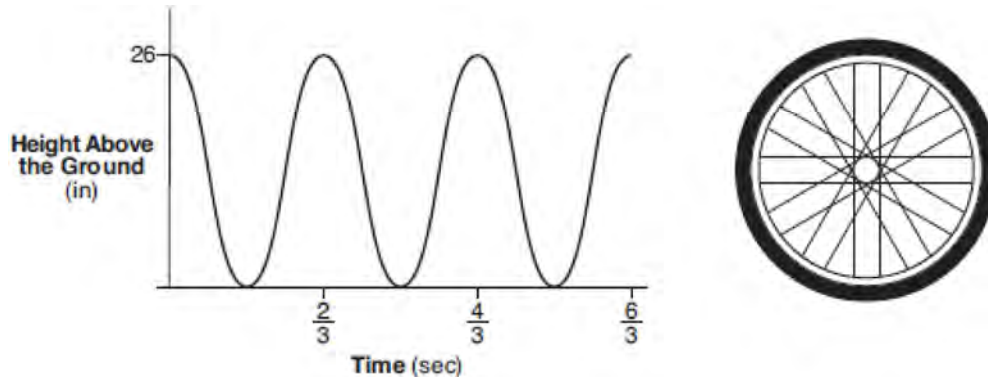
Identify the period of the graph and describe what the period represents in this context.

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

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

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

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

208 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.

209 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 $\dfrac{974}{1376}$, what is the probability that a student participates in both sports and music?

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

211 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.

212 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.

213 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.

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

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

216 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.

217 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

218 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \dfrac{r(a)}{d(a)}$.

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

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

221 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.

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

41

223 Graph $y = 400(.85)^{2x} - 6$ on the set of axes below.
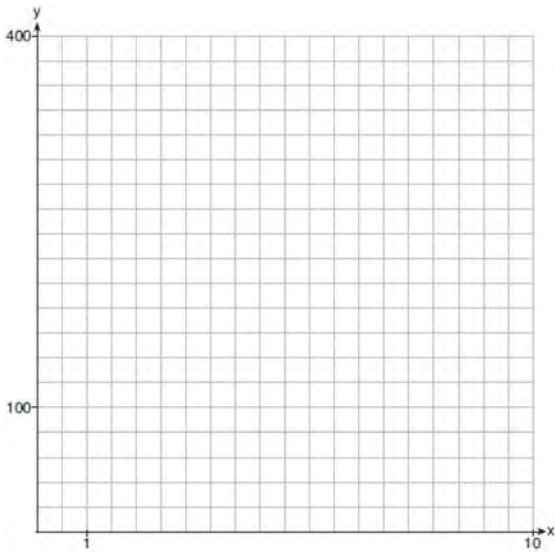
224 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and -2.
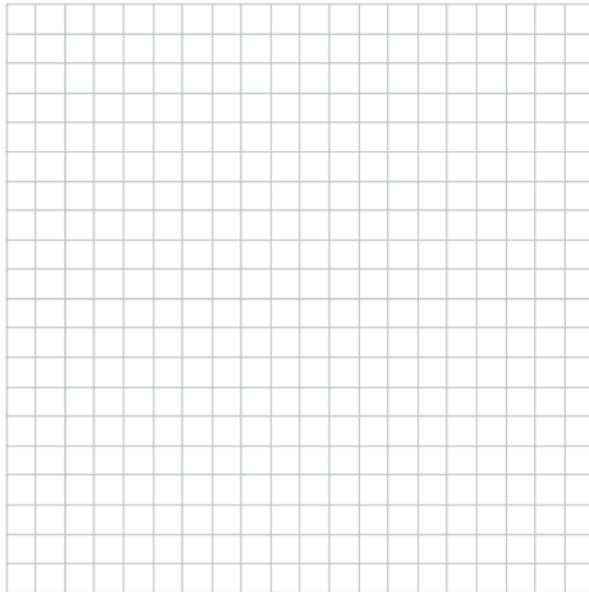
225 Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\dfrac{f(x)}{g(x)}$, in the form $q(x) + \dfrac{r(x)}{g(x)}$.

226 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.

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

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

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

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

229 Solve for x: $\dfrac{1}{x} - \dfrac{1}{3} = -\dfrac{1}{3x}$

230 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.
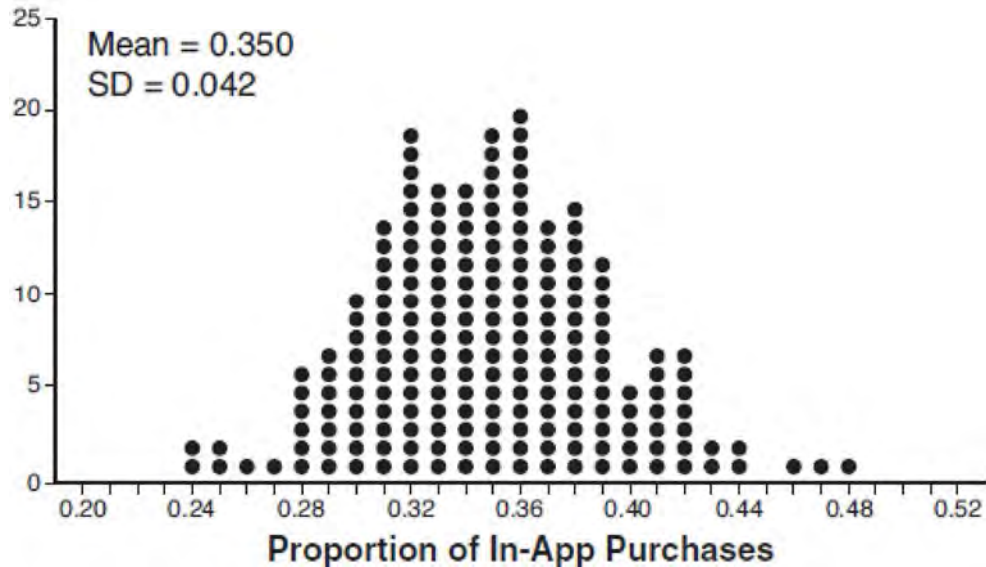
Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.

231 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.

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

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

43

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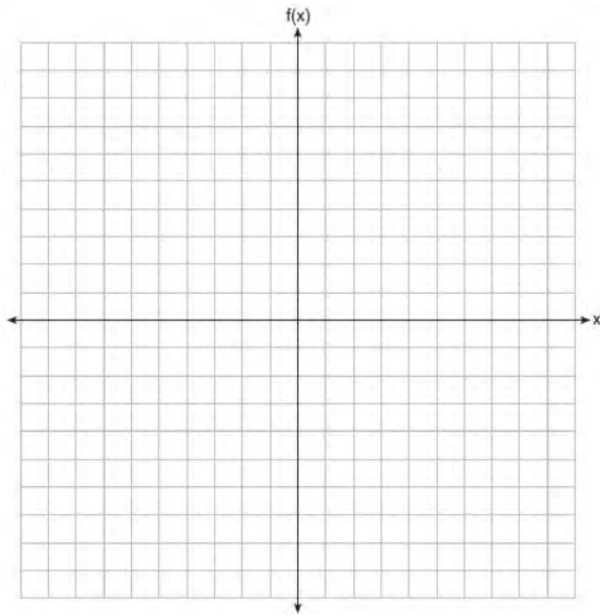
f(x)

235 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.

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

237 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.

238 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*.

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

240 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.

How's My Driving?
Call 1-555-DRIVING

The driver who receives the highest number of
positive comments will win the recognition.
Explain *one* statistical bias in this data collection
method.

241 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.

242 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.

243 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.

244 Verify the following Pythagorean identity for all values of x and y:
$$(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$$

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

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

247 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.

248 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*.

249 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.

250 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.

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

$$y = x - 28$$

252 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*.

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

$M = $ monthly payment
$P = $ amount borrowed
$r = $ annual interest rate
$n = $ total number of monthly payments

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

254 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.

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

46
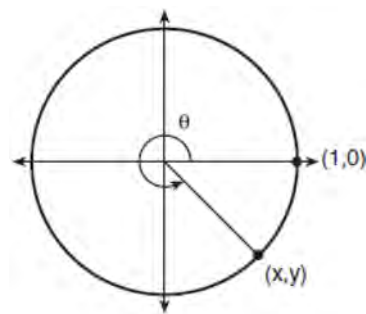
256 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	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.

257 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.
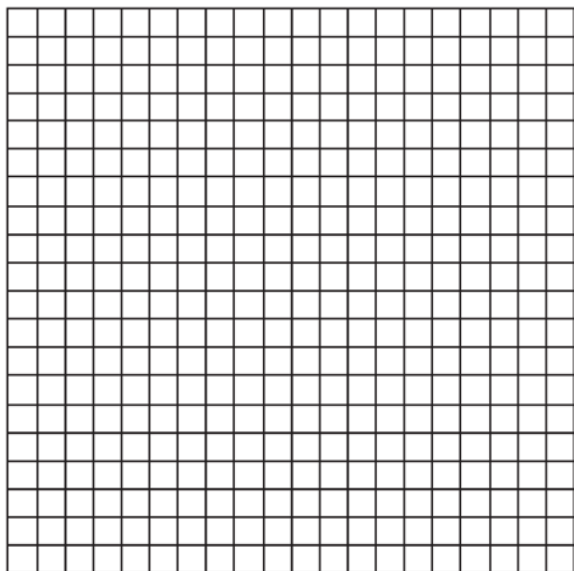
259 Express the fraction $\dfrac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$ in simplest radical form.

260 Graph $t(x) = 3\sin(2x) + 2$ over the domain $[0, 2\pi]$ on the set of axes below.
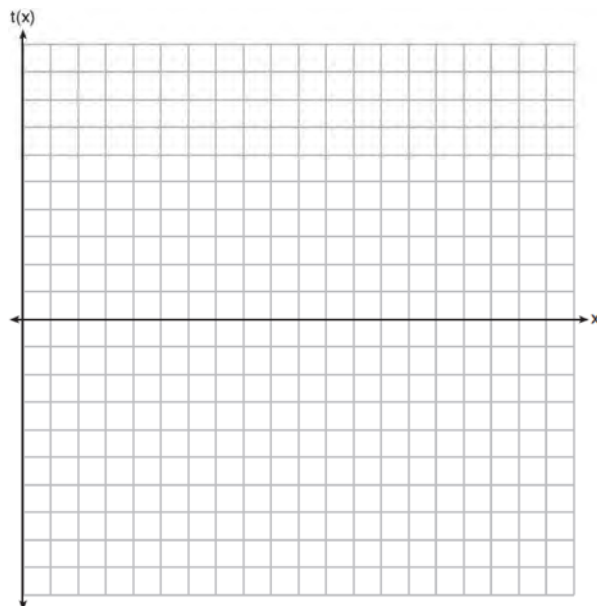
258 Algebraically determine the values of x that satisfy the system of equations below.

$$y = -2x + 1$$

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

261 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.

262 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 $(3-i)$.

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

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

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

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

267 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.

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

269 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.

270 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.

271 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.

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

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

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

274 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.

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

276 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?
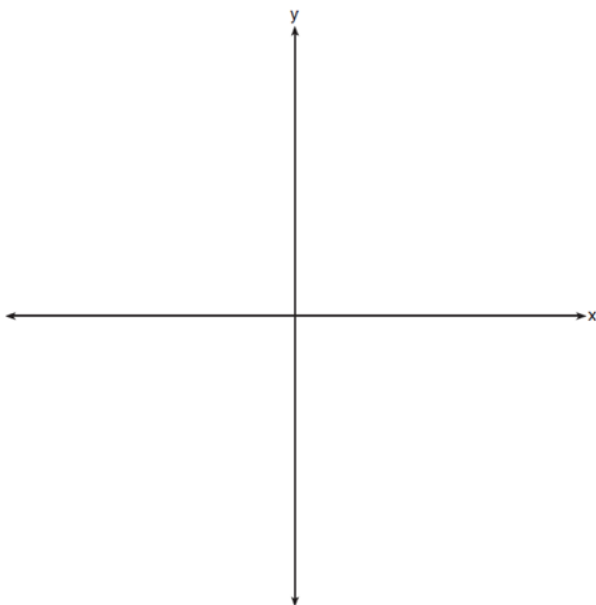
Algebra II 4 Point Regents Exam Questions

277 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 $n > 1$?

278 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.

279 Solve for all values of p: $\dfrac{3p}{p-5} - \dfrac{2}{p+3} = \dfrac{p}{p+3}$

280 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.

281 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.

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

283 Solve the system of equations shown below algebraically.

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

$$2x + 2y = 10$$

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

285 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*.

286 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.

287 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.

288 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 $j(x)$.

289 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.

290 The graph of $y = f(x)$ is shown below. The function has a leading coefficient of 1.
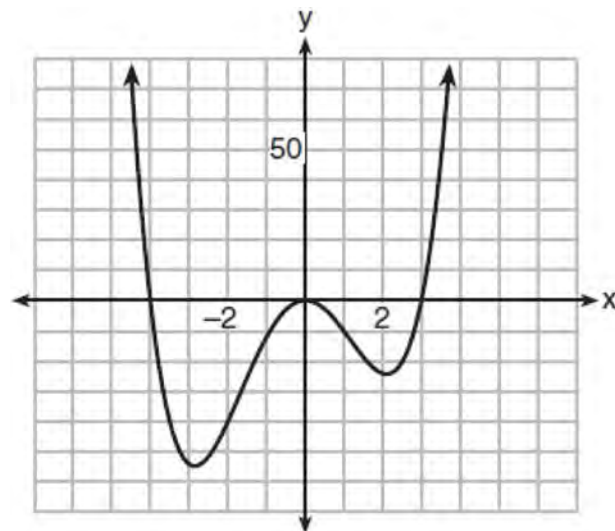
Write an equation for $f(x)$. The function g is formed by translating function f left 2 units. Write an equation for $g(x)$.

291 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\overline{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented -unscented). A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.
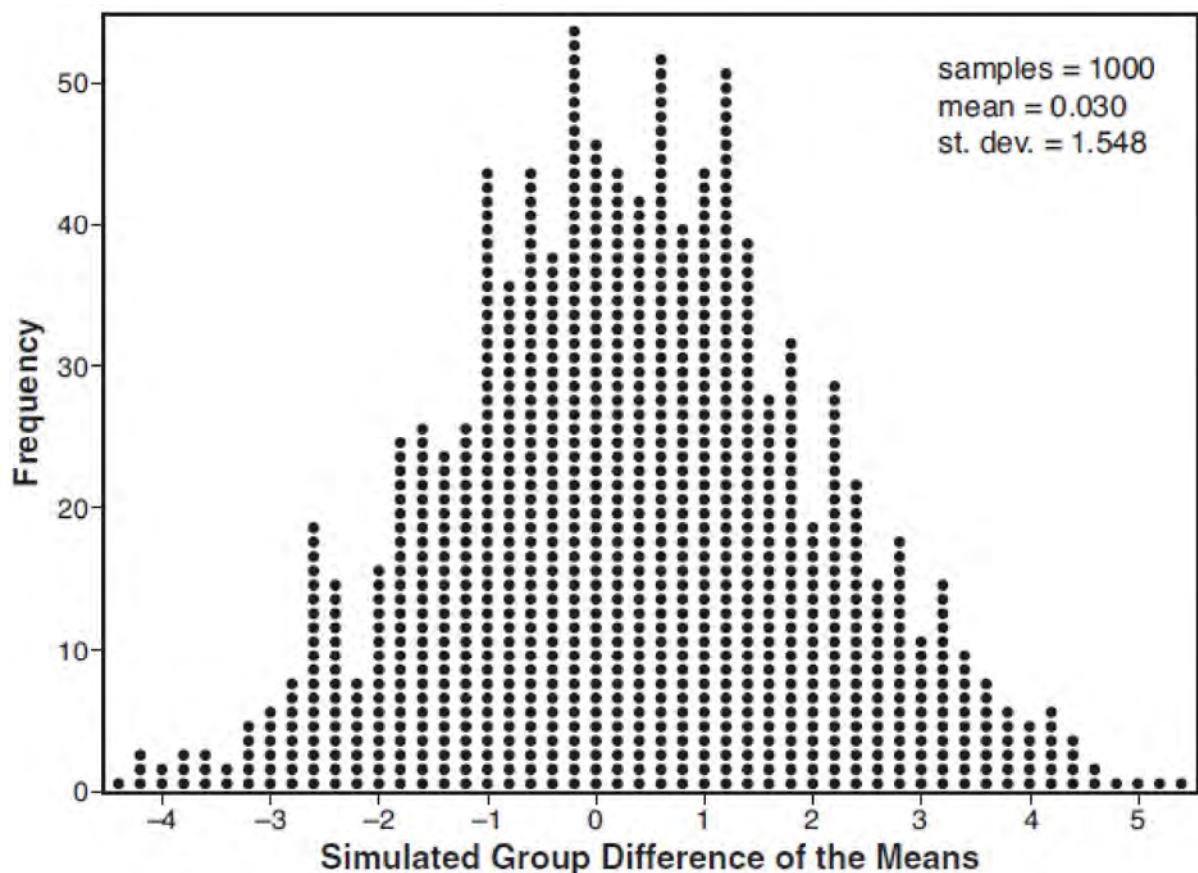
Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*. Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

292 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.
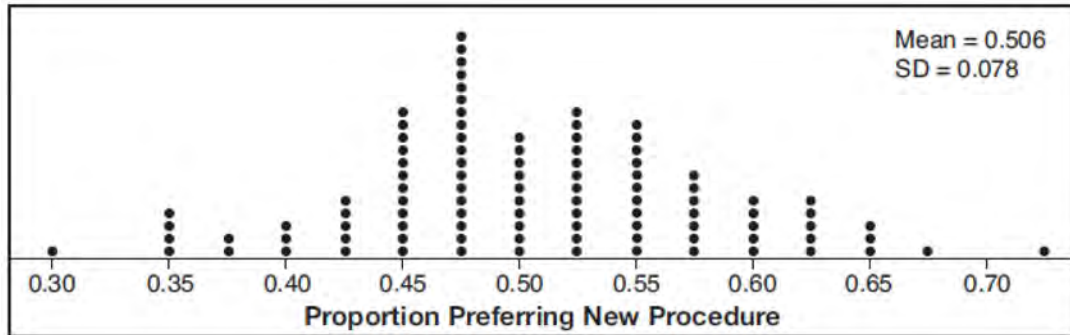
Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*. Forty customers are selected randomly 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.

293 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.

294 Solve algebraically for all values of x:
$$\sqrt{6-2x} + x = 2(x+15) - 9$$

295 Algebraically determine the values of h and k to correctly complete the identity stated below.
$$2x^3 - 10x^2 + 11x - 7 = (x-4)(2x^2 + hx + 3) + k$$

296 Seventy-two students are randomly divided into two equally-sized study groups. Each member of the first group (group 1) is to meet with a tutor after school twice each week for one hour. The second group (group 2), is given an online subscription to a tutorial account that they can access for a maximum of two hours each week. Students in both groups are given the same tests during the year. A summary of the two groups' final grades is shown below:

	Group 1	Group 2
$\overline{x}$	80.16	83.8
S_x	6.9	5.2

Calculate the mean difference in the final grades (group 1 – group 2) and explain its meaning in the context of the problem. A simulation was conducted in which the students' final grades were rerandomized 500 times. The results are shown below.
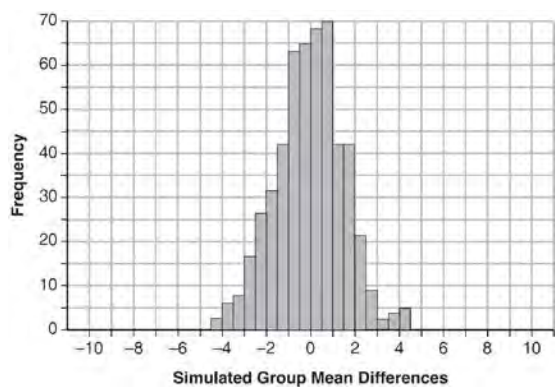
Use the simulation to determine if there is a significant difference in the final grades. Explain your answer.

297 Solve the following system of equations algebraically for all values of x, y, and z:

$$2x + 3y - 4z = -1$$

$$x - 2y + 5z = 3$$

$$-4x + y + z = 16$$

298 Solve the following system of equations algebraically for all values of x, y, and z:

$$x + 3y + 5z = 45$$

$$6x - 3y + 2z = -10$$

$$-2x + 3y + 8z = 72$$

299 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90, 89
Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer. To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.
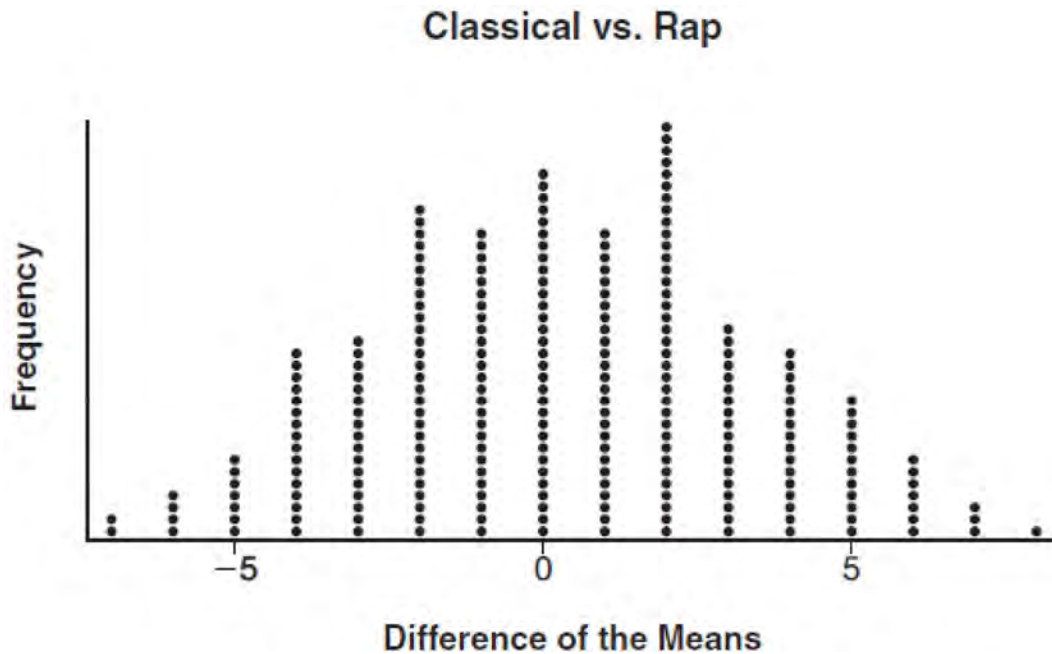
Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

300 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.

301 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.

Mean = 0.247
S. D. = 0.062

0.10 0.14 0.18 0.22 0.26 0.30 0.34 0.38 0.42

Proportion Preferring Stephen's Product
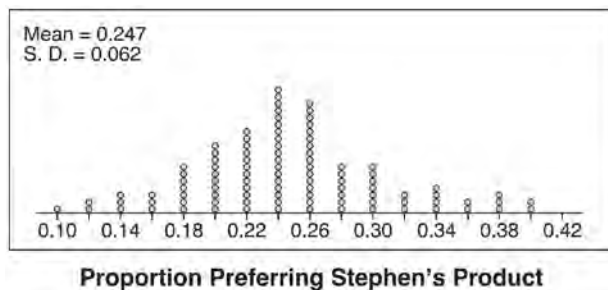
Assume the set of data is approximately normal and the company wants to be 95% confident of its results. Does the sample proportion obtained from the blind taste-test, nine out of fifty, fall within the margin of error developed from the simulation? Justify your answer. The company decides to continue 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.

302 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.

303 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?

304 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students.
Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in
group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times
were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

Group 1 (seconds)	Group 2 (seconds)
17.4	23.3
18.1	18.8
18.2	22.1
19.6	12.7
18.6	16.9
16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design
or the results, explain why Ayva's hypothesis may be *incorrect*. Using the given results, Ayva randomly mixes
the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.

Simulated Differences

Differences (Group 1 – Group 2)
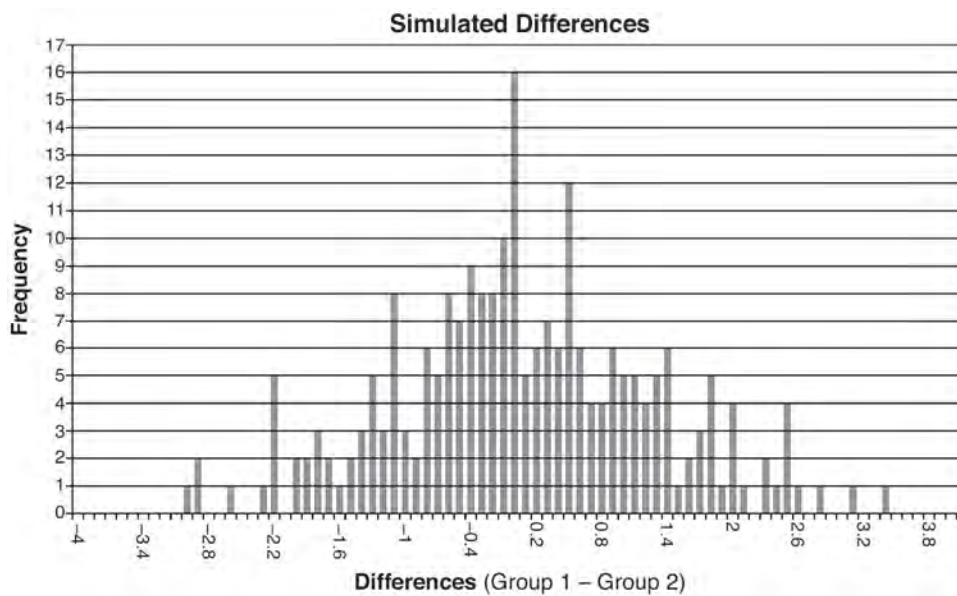
Ayva has decided that the difference in mean reading times is not an unusual occurrence. Support her decision
using the results of the simulation. Explain your reasoning.

305 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

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

306 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*.

307 Solve the following system of equations algebraically for all values of x, y, and z:

$$x + y + z = 1$$
$$2x + 4y + 6z = 2$$
$$-x + 3y - 5z = 11$$

308 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\dfrac{\pi}{3}t\right) + 8$, 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.

309 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.
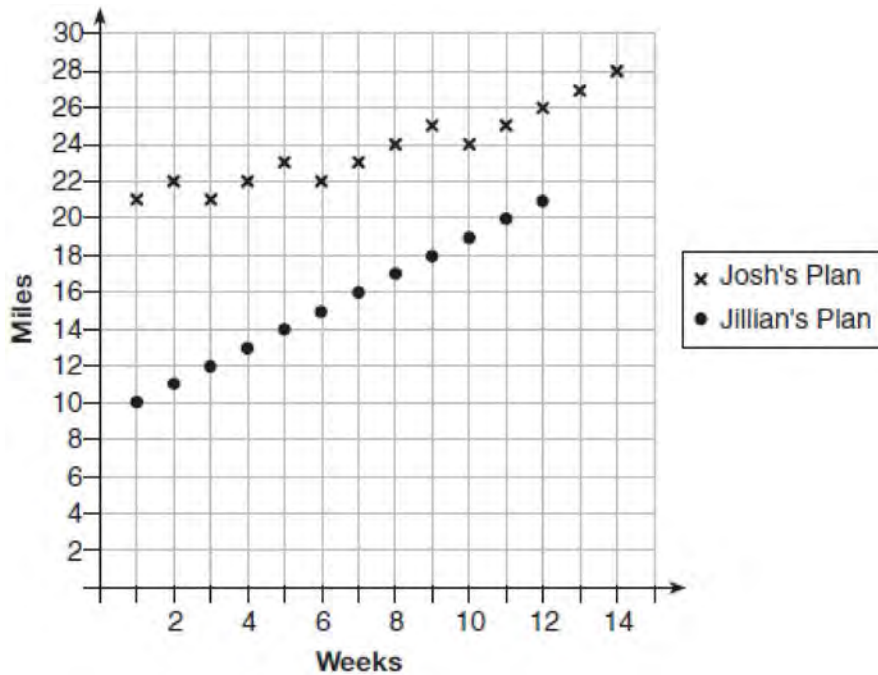
Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer. Write a recursive
definition to represent the number of miles run each week for the duration of the plan you chose. Jillian's plan has
an alternative if Elaina wanted to train instead for a full 26-mile marathon. 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.

310 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.

311 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.

312 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*.

313 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.

314 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$. On the set of axes below, graph $y = p(x)$.
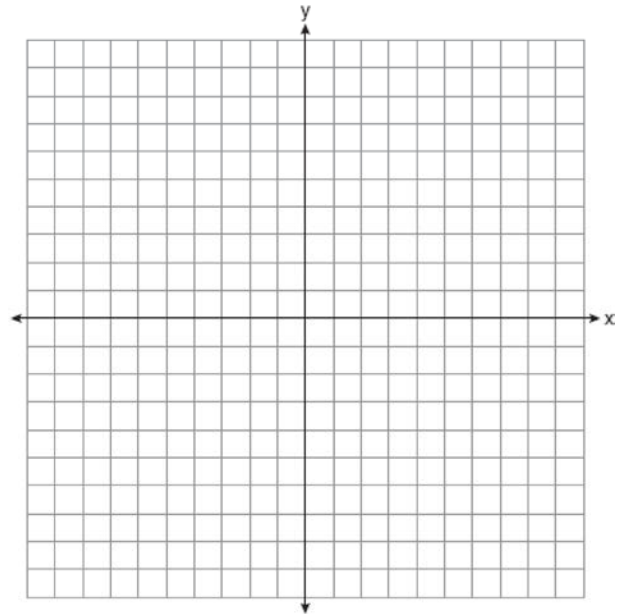
315 Graph $y = \log_2(x+3) - 5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.
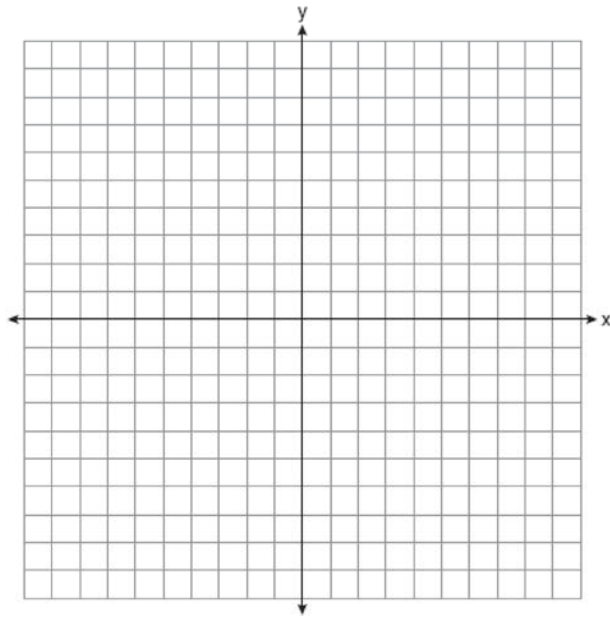
Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

316 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.
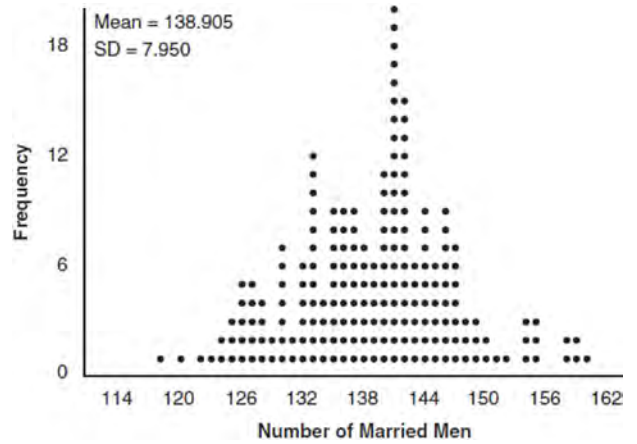
a) Based on the simulation, create an interval in which the middle 95% of the number of married men may fall. Round your answer to the *nearest integer*.

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.

317   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.
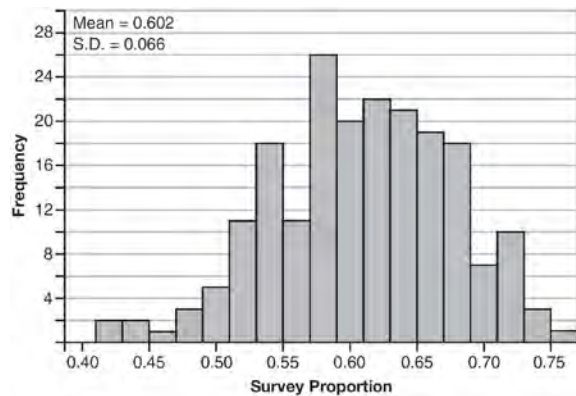
Using the results of the simulation, determine a plausible interval containing the middle 95% of the data. Round all values to the *nearest hundredth*. Members of the prom committee are concerned that a vote of all students attending the prom may produce a 50% − 50% split. Explain what statistical evidence supports this concern.

Algebra II 6 Point Regents Exam Questions

318 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.
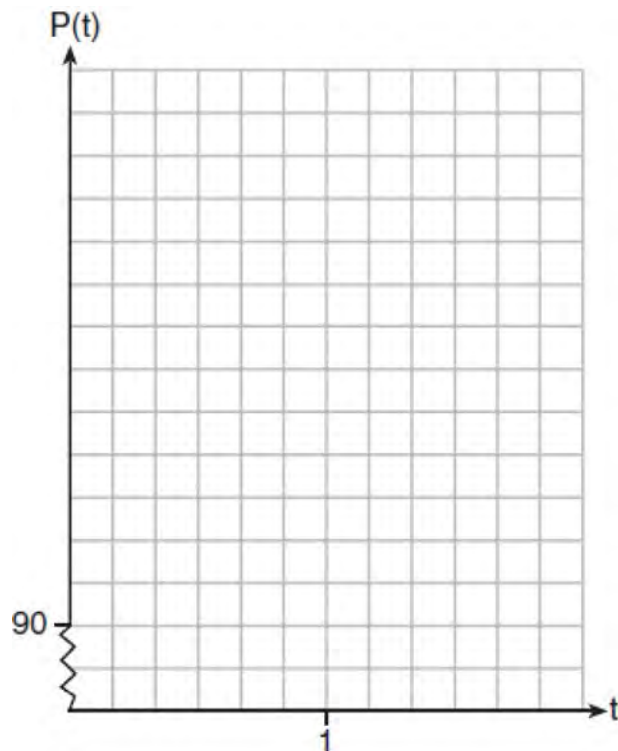
$$P(t) = 24\cos(3\pi t) + 120$$

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.

319 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.

320 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.

321 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.
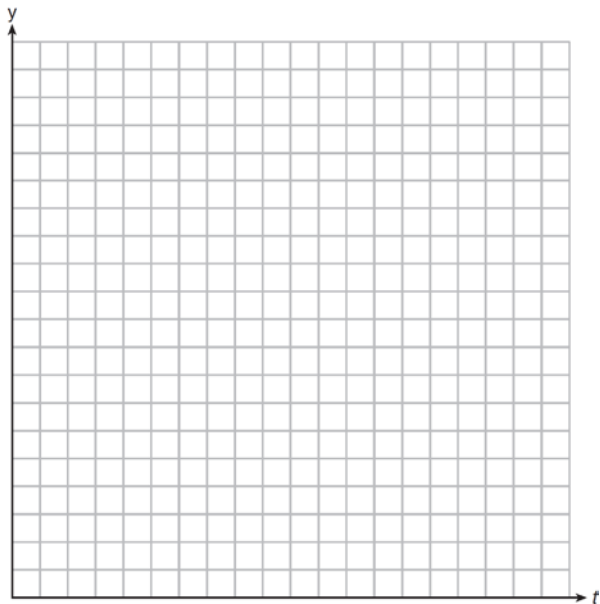
To the *nearest hour*, t, when does the amount of the given drug remaining in patient B begin to exceed the amount of the given drug remaining in patient A? The doctor will allow patient A to take another 800 milligram dose of the drug once only 15% of the original dose is left in the body. Determine, to the *nearest tenth of an hour*, how long patient A will have to wait to take another 800 milligram dose of the drug.

322 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.
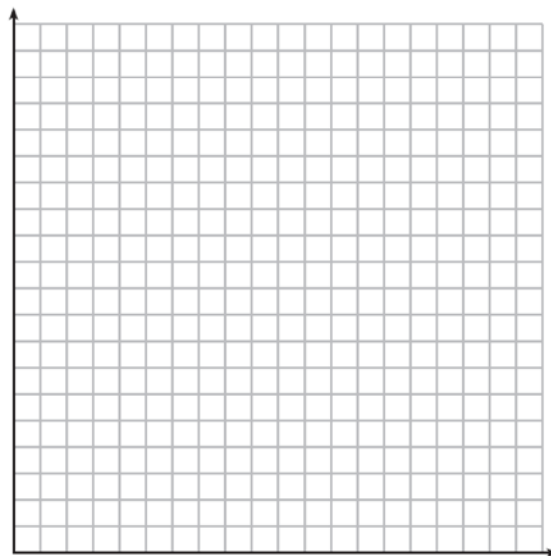
State when $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem. Zach takes out an insurance policy that requires him to pay a $3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year*, how long will it take Zach to cancel this policy? Justify your answer.

65

323 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.
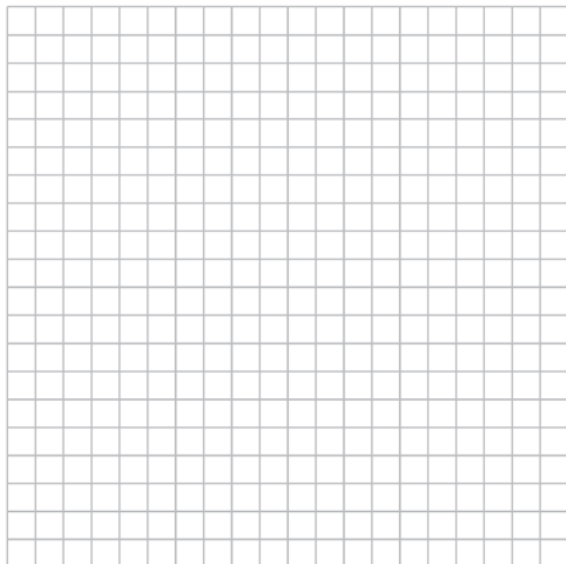
People who fish in Carter Beach know that a certain species of fish is most plentiful when the water level is increasing. Explain whether you would recommend fishing for this species at 7:30 p.m. or 10:30 p.m. using evidence from the given context.

324 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 $2 \le x \le 16$.
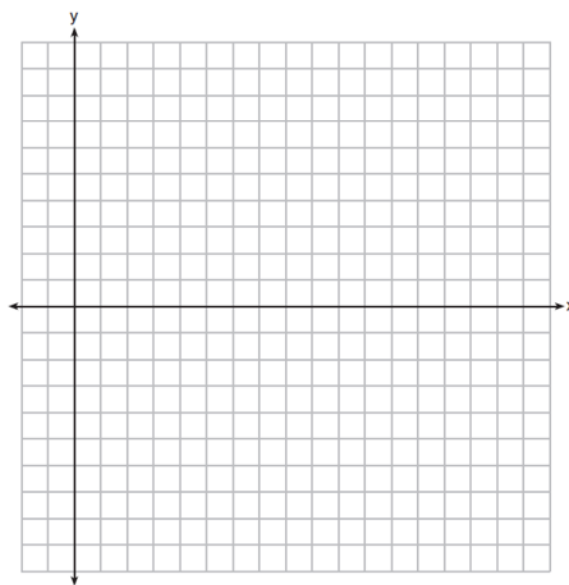
Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

325 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 $A = A_0 \left(\dfrac{1}{2} \right)^{\frac{t}{h}}$ 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*.

326 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.

327 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.

Popularity Rating

Site Visits (in thousands)
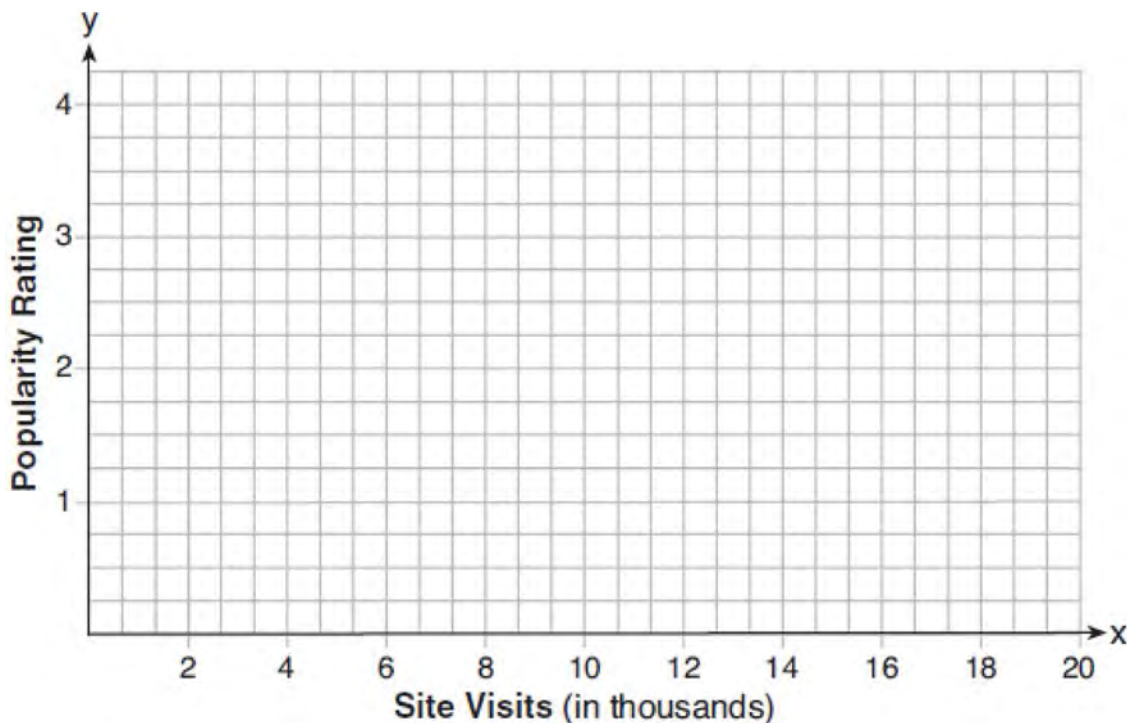
An alternative rating model is represented by $R(x) = \dfrac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

Algebra II Multiple Choice Regents Exam Questions
Answer Section

1 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

2 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
KEY: AII

3 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: Operations with Radicals
KEY: with variables, index > 2

4 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.D.6   TOP: Solving Polynomial Equations

5 ANS: 2

Combining (1) and (3): $-6c = -18$ Combining (1) and (2): $5a + 3c = -1$ Using (3): $-(-2) - 5b - 5(3) = 2$

$c = 3$ $5a + 3(3) = -1$ $2 - 5b - 15 = 2$

$5a = -10$ $b = -3$

$a = -2$

REF: 081623aii   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: three variables

6 ANS: 1
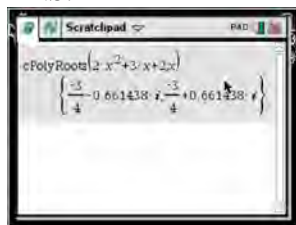
$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(2)}}{2(2)} = \frac{-3 \pm \sqrt{-7}}{4} = -\frac{3}{4} \pm \frac{i\sqrt{7}}{4}$$

REF: 061612aii   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

7 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

8 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

9 ANS: 1   REF: 081813aii   NAT: A.SSE.B.4   TOP: Series

10 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

11 ANS: 4
There is no x-intercept.

REF: 011823aii   NAT: F.IF.C.7   TOP: Graphing Exponential Functions
KEY: AII

12 ANS: 4

$4x^2 = -98$

$x^2 = -\dfrac{98}{4}$

$x^2 = -\dfrac{49}{2}$

$x = \pm\sqrt{-\dfrac{49}{2}} = \pm\dfrac{7i}{\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \pm\dfrac{7i\sqrt{2}}{2}$

REF: 061707aii   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: complex solutions | taking square roots

13 ANS: 3   REF: 061602aii   NAT: A.CED.A.1   TOP: Modeling Rationals

14 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
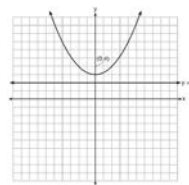KEY: rational solutions

15 ANS: 4

$496 \pm 2(115)$

REF: 011718aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: interval

16 ANS: 4

A parabola with a focus of $(0,4)$ and a directrix of $y = 2$ is sketched as follows: By inspection, it is determined that the vertex of the parabola is $(0,3)$. It is also evident that the distance, p, between the vertex and the focus is 1. It is possible to use the formula $(x - h)^2 = 4p(y - k)$ to derive the equation of the parabola as follows: $(x - 0)^2 = 4(1)(y - 3)$

$$x^2 = 4y - 12$$

$$x^2 + 12 = 4y$$

$$\frac{x^2}{4} + 3 = y$$

or A point (x,y) on the parabola must be the same distance from the focus as it is from the directrix. For any such point (x,y), the distance to the focus is $\sqrt{(x - 0)^2 + (y - 4)^2}$ and the distance to the directrix is $y - 2$. Setting this equal leads to: $x^2 + y^2 - 8y + 16 = y^2 - 4y + 4$

$$x^2 + 16 = 4y + 4$$

$$\frac{x^2}{4} + 3 = y$$

REF: spr1502aii   NAT: G.GPE.A.2   TOP: Graphing Quadratic Functions

17 ANS: 3   REF: 061623aii   NAT: F.BF.A.2   TOP: Sequences

18 ANS: 1

$$(x + 7)(x - 1) = x^2 + 6x - 7 = x^2 + 6x + 9 - 7 - 9 = (x + 3)^2 - 16$$

REF: 061808aii   NAT: A.APR.C.4   TOP: Polynomial Identities

19 ANS: 3

Since $x + 4$ is a factor of $p(x)$, there is no remainder.

REF: 081621aii   NAT: A.APR.B.2   TOP: Remainder Theorem

20 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: AII

4

21 ANS: 4
$3x - (-2x + 14) = 16$ $3(6) - 4z = 2$

$$5x = 30$$ $$-4z = -16$$

$$x = 6$$ $$z = 4$$

REF: 011803aii   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: three variables

22 ANS: 1

$$\require{enclose}\begin{array}{r} 3x^2 + 4x - 1 \\ 2x+3 \enclose{longdiv}{6x^3 + 17x^2 + 10x + 2} \\ \underline{6x^3 + 9x^2} \\ 8x^2 + 10x \\ \underline{8x^2 + 12x} \\ -2x + 2 \\ \underline{-2x - 3} \\ 5 \end{array}$$

REF: fall1503aii   NAT: A.APR.D.6   TOP: Rational Expressions
KEY: division

23 ANS: 2
$h(x)$ does not have a y-intercept.

REF: 011719aii   NAT: F.IF.C.9   TOP: Comparing Functions

24 ANS: 3   REF: 081724aii   NAT: F.BF.A.2   TOP: Sequences

25 ANS: 1

$$9110 = 5000e^{30r}$$

$$\ln\frac{911}{500} = \ln e^{30r}$$

$$\frac{\ln\dfrac{911}{500}}{30} = r$$

$$r \approx .02$$

REF: 011810aii   NAT: F.LE.A.4   TOP: Exponential Growth

26 ANS: 2   REF: 061816aii   NAT: F.IF.C.7   TOP: Graphing Polynomial Functions
KEY: bimodalgraph

27 ANS: 3
Self selection causes bias.

REF: 061703aii   NAT: S.IC.B.3   TOP: Analysis of Data
KEY: bias

28 ANS: 1
(2) is not recursive

REF: 081608aii   NAT: F.BF.A.2   TOP: Sequences

29 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: A.SSE.B.3   TOP: Modeling Exponential Functions
KEY: AII

30 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: F.IF.C.7   TOP: Graphing Polynomial Functions
KEY: bimodalgraph

31 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

32 ANS: 4   REF: 081817aii   NAT: F.BF.B.3   TOP: Transformations with Functions

33 ANS: 1

$$1240(1.06)^x = 890(1.11)^x$$

$$x \approx 7$$

REF: 061814aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII

34 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.B.7   TOP: Theoretical Probability

35 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

36 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 Theorem

37 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

38 ANS: 4

$$p(5) = 2(5)^3 - 3(5) + 5 = 240$$

REF: 011819aii   NAT: A.APR.B.2   TOP: Remainder Theorem

39 ANS: 1   REF: 061708aii   NAT: F.TF.B.5   TOP: Modeling Trigonometric Functions

40 ANS: 3
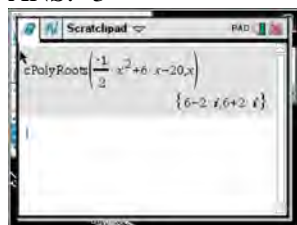
$$-2\left(-\frac{1}{2}x^2 = -6x + 20\right)$$

$$x^2 - 12x = -40$$

$$x^2 - 12x + 36 = -40 + 36$$

$$(x - 6)^2 = -4$$

$$x - 6 = \pm 2i$$

$$x = 6 \pm 2i$$

REF: fall1504aii   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: complex solutions | completing the square

41 ANS: 3

$$1^3 - k(1)^2 + 2(1) = 0$$

$$k = 3$$

REF: 061812aii   NAT: A.APR.B.3   TOP: Zeros of Polynomials
KEY: AII

42 ANS: 1

$$x^4 - 4x^3 - 9x^2 + 36x = 0$$
$$x^3(x - 4) - 9x(x - 4) = 0$$
$$(x^3 - 9x)(x - 4) = 0$$
$$x(x^2 - 9)(x - 4) = 0$$
$$x(x + 3)(x - 3)(x - 4) = 0$$
$$x = 0, \pm 3, 4$$

REF: 061606aii   NAT: A.APR.B.3   TOP: Zeros of Polynomials
KEY: AII

43 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

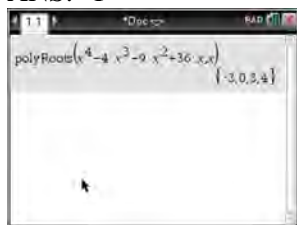44 ANS: 2   REF: 011720aii   NAT: A.APR.B.2   TOP: Remainder Theorem

45 ANS: 4   REF: 061706aii   NAT: F.IF.B.4   TOP: Graphing Trigonometric Functions

46 ANS: 2   REF: 061620aii   NAT: F.IF.B.4   TOP: Graphing Polynomial Functions

47 ANS: 1

A reference triangle can be sketched using the coordinates $(-4, 3)$ in the second quadrant to find the value of $\sin \theta$.
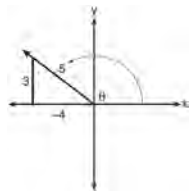
REF: spr1503aii   NAT: F.TF.A.2   TOP: Determining Trigonometric Functions
KEY: extension to reals

48 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

49 ANS: 2
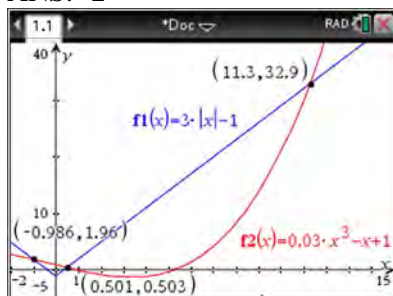
REF: 061705aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII

50 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

51 ANS: 1   REF: 011704aii   NAT: F.TF.C.8   TOP: Simplifying Trigonometric Expressions

52 ANS: 4

$$y = g(x) = (x-2)^2 \qquad (x-2)^2 = 3x - 2 \quad y = 3(6) - 2 = 16$$

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

$$x^2 - 7x + 6 = 0$$

$$(x-6)(x-1) = 0$$

$$x = 6, 1$$

REF: 011705aii   NAT: A.REI.C.7   TOP: Quadratic-Linear Systems
KEY: AII

53 ANS: 1   REF: 011815aii   NAT: F.TF.A.2   TOP: Unit Circle

54 ANS: 4
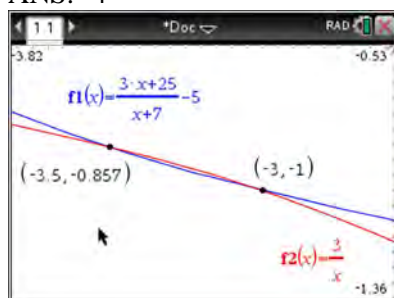
$$x(x+7)\left[\frac{3x+25}{x+7} - 5 = \frac{3}{x}\right]$$

$$x(3x+25) - 5x(x+7) = 3(x+7)$$

$$3x^2 + 25x - 5x^2 - 35x = 3x + 21$$

$$2x^2 + 13x + 21 = 0$$

$$(2x+7)(x+3) = 0$$

$$x = -\frac{7}{2}, -3$$

REF: fall1501aii   NAT: A.REI.A.2   TOP: Solving Rationals
KEY: rational solutions

55 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

56 ANS: 2

REF: 011712aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII

57 ANS: 3
$440 \times 2.3\% \approx 10$

REF: 011807aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: predict

58 ANS: 2

$$\sqrt{x+14} = \sqrt{2x+5} + 1 \qquad\qquad \sqrt{22+14} - \sqrt{2(22)+5} = 1$$

$$x + 14 = 2x + 5 + 2\sqrt{2x+5} + 1 \qquad\qquad 6 - 7 \neq 1$$

$$-x + 8 = 2\sqrt{2x+5}$$

$$x^2 - 16x + 64 = 8x + 20$$

$$x^2 - 24x + 44 = 0$$

$$(x - 22)(x - 2) = 0$$
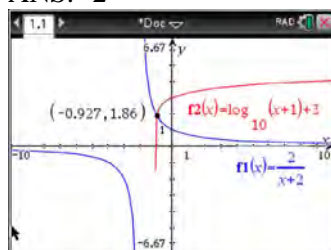
$$x = 2, 22$$

REF: 081704aii   NAT: A.REI.A.2   TOP: Solving Radicals
KEY: advanced

59 ANS: 1

In vertex form, the parabola is $y = -\dfrac{1}{4(2)}(x+4)^2 + 3$. The vertex is $(-4,3)$ and $p = 2$. $3 + 2 = 5$

REF: 011816aii   NAT: G.GPE.A.2   TOP: Graphing Quadratic Functions

60 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

61 ANS: 2   REF: 011820aii   NAT: S.IC.A.2   TOP: Analysis of Data
62 ANS: 2   REF: 081802aii   NAT: S.IC.B.3   TOP: Analysis of Data
KEY: type
63 ANS: 4   REF: 081707aii   NAT: F.TF.A.2   TOP: Reference Angles
KEY: bimodalgraph
64 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
KEY: AII

65 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

66 ANS: 2   REF: 081610aii   NAT: F.IF.B.4   TOP: Graphing Trigonometric Functions
KEY: increasing/decreasing

67 ANS: 2

$1.00643^{12} \approx 1.08$

REF: 081808aii   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

68 ANS: 2   REF: 061804aii   NAT: S.ID.B.6   TOP: Regression
KEY: choose model

69 ANS: 4
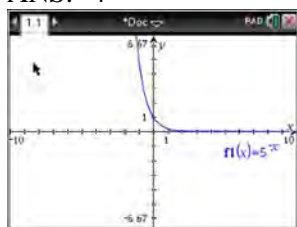
    $y = 5^{-t} = \left(\frac{1}{5}\right)^t$

REF: 061615aii   NAT: F.IF.C.7   TOP: Graphing Exponential Functions

70 ANS: 1

REF: 081711aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: percent

71 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

72 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

73 ANS: 4

$\dfrac{-3x^2 - 5x + 2}{x^3 + 2x^2} = \dfrac{(-3x+1)(x+2)}{x^2(x+2)} = \dfrac{-3x}{x^2} + \dfrac{1}{x^2} = -3x^{-1} + x^{-2}$

REF: 061723aii   NAT: A.APR.D.6   TOP: Expressions with Negative Exponents
KEY: variables

74 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

75 ANS: 1   REF: 061701aii   NAT: A.APR.B.3   TOP: Zeros of Polynomials
KEY: AII

76 ANS: 1

$P(28) = 5(2)^{\frac{98}{28}} \approx 56$

REF: 011702aii   NAT: F.LE.A.2   TOP: Modeling Exponential Functions
KEY: AII

77 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

78 ANS: 3   REF: 061722aii   NAT: A.CED.A.1   TOP: Modeling Rationals

79 ANS: 3   REF: 011706aii   NAT: S.IC.B.3   TOP: Analysis of Data
KEY: type

80 ANS: 1
The car lost approximately 19% of its value each year.

REF: 081613aii   NAT: F.LE.B.5   TOP: Modeling Exponential Functions

81 ANS: 4   REF: 081810aii   NAT: F.LE.A.2   TOP: Sequences
82 ANS: 4   REF: 061716aii   NAT: N.RN.A.2   TOP: Radicals and Rational Exponents
    KEY: variables
83 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: AII
84 ANS: 4   REF: 081803aii   NAT: F.BF.A.1   TOP: Operations with Functions
85 ANS: 2

$$B(t) = 750\left(1.16^{\frac{1}{12}}\right)^{12t} \approx 750(1.012)^{12t} \quad B(t) = 750\left(1 + \frac{0.16}{12}\right)^{12t}$$ 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
    KEY: AII
86 ANS: 3

$$\begin{array}{r}
2x^3 - 4x^2 - x + \dfrac{14}{x+6} \\
x+6\overline{\smash{\big)}\,2x^4 + 8x^3 - 25x^2 - 6x + 14} \\
\underline{2x^4 + 12x^3} \\
-4x^3 - 25x^2 \\
\underline{-4x^3 - 24x^2} \\
-x^2 - 6x \\
\underline{-x^2 - 6x}
\end{array}$$

    REF: 081805aii   NAT: A.APR.D.6   TOP: Rational Expressions
    KEY: division
87 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: other
88 ANS: 3   REF: 061607aii   NAT: S.IC.A.2   TOP: Analysis of Data

89 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: Operations with Radicals
KEY: with variables, index > 2

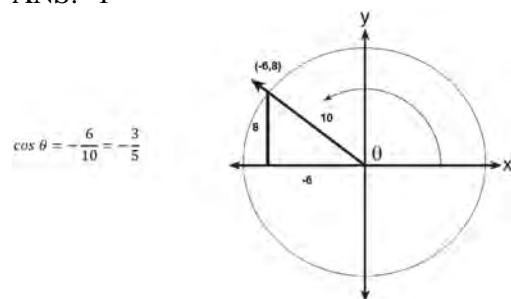90 ANS: 2 REF: 011709aii NAT: S.IC.B.5 TOP: Analysis of Data

91 ANS: 4 REF: 011808aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions
KEY: AII

92 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

93 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

94 ANS: 4

$$\frac{5+9}{2} = 7, \text{ vertex: } (-2,7); \; p = 7 - 9 = -2, \; y = \frac{1}{4(-2)}(x+2)^2 + 7$$

$$y - 7 = \frac{1}{-8}(x+2)^2$$

$$-8(y-7) = (x+2)^2$$

REF: 061821aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

95 ANS: 1 REF: 081722aii NAT: S.IC.B.6 TOP: Analysis of Data

96 ANS: 4
$0.48 \cdot 0.25 = 0.12$

REF: 061811aii NAT: S.CP.A.2 TOP: Probability of Compound Events
KEY: probability

97 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

98 ANS: 2   REF: 061802aii   NAT: F.IF.C.7   TOP: Graphing Exponential Functions
KEY: AII

99 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

100 ANS: 3
The graph shows three real zeros, and has end behavior matching the given end behavior.

REF: 061604aii   NAT: F.IF.C.7   TOP: Graphing Polynomial Functions
KEY: bimodalgraph

101 ANS: 2

$$\frac{85}{210 + 85}$$

REF: 081818aii   NAT: S.CP.A.1   TOP: Venn Diagrams

102 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

103 ANS: 2

$$ME = \left(z\sqrt{\frac{p(1-p)}{n}} \right) = \left(1.96\sqrt{\frac{(0.16)(0.84)}{1334}} \right) \approx 0.02$$

REF: 081716aii   NAT: S.IC.B.4   TOP: Analysis of Data

104 ANS: 1

$$2x - 1 \overline{) 4x^3 + 0x^2 + 9x - 5} \quad \frac{2x^2 + x + 5}{}$$

$$\underline{4x^3 - 2x^2}$$

$$2x^2 + 9x$$

$$\underline{2x^2 - x}$$

$$10x - 5$$

$$\underline{10x - 5}$$

REF: 081713aii   NAT: A.APR.D.6   TOP: Rational Expressions
KEY: division

105 ANS: 4

$$(a + b + c)^2 = a^2 + ab + ac + ab + b^2 + bc + ac + ab + c^2$$

$$x = a^2 + b^2 + c^2 + 2(ab + bc + ac)$$

$$x = y + 2z$$

REF: 061822aii   NAT: A.APR.C.4   TOP: Polynomial Identities

106 ANS: 3
(3) repeats 3 times over 2π.

REF: 011722aii   NAT: F.IF.C.7   TOP: Graphing Trigonometric Functions
KEY: recognize | bimodalgraph

107 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

108 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
KEY: AII

109 ANS: 1   REF: 081609aii   NAT: F.BF.B.6   TOP: Sigma Notation
KEY: represent

110 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

111 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

112 ANS: 1

$$-4(-1) - 3 = 1 \quad 8 = \frac{2\pi}{b}$$

$$b = \frac{\pi}{4}$$

REF: 081820aii   NAT: F.IF.B.4   TOP: Graphing Trigonometric Functions
KEY: maximum/minimum

113 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 AII

114 ANS: 4
The vertex is $(2, 2)$ and $p = 3$. $3 + 2 = 5$

REF: 081823aii   NAT: G.GPE.A.2   TOP: Graphing Quadratic Functions

115 ANS: 2   REF: 061724aii   NAT: A.SSE.B.4   TOP: Series

116 ANS: 4

$$(x^6 y^4 - 9)(x^4 - 16)$$

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

REF: 081814aii   NAT: A.SSE.A.2   TOP: Factoring the Difference of Perfect Squares
KEY: multivariable AII

117 ANS: 3   REF: 081705aii   NAT: F.IF.B.4   TOP: Graphing Trigonometric Functions
KEY: increasing/decreasing

118 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.

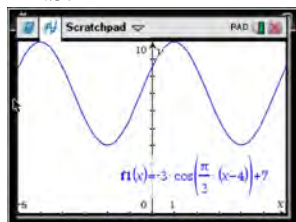REF: 081720aii   NAT: A.APR.B.2   TOP: Remainder Theorem

119 ANS: 4

1 year = 365 days

REF: 061823aii   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions
KEY: AII

120 ANS: 4

As the range is [4,10], the midline is $y = \dfrac{4 + 10}{2} = 7$.

REF: fall1506aii   NAT: F.IF.C.7   TOP: Graphing Trigonometric Functions
KEY: mixed

121 ANS: 2

$$P = \frac{2\pi}{\frac{\pi}{45}} = 90$$

REF: 081822aii   NAT: F.IF.C.7   TOP: Graphing Trigonometric Functions
KEY: period

122 ANS: 4   REF: 081824aii   NAT: S.CP.A.3   TOP: Conditional Probability

123 ANS: 4   REF: 011805aii   NAT: F.LE.B.5   TOP: Modeling Exponential Functions

124 ANS: 1

$$\frac{N(10) - N(1)}{10 - 1} \approx -2.03, \quad \frac{N(20) - N(10)}{20 - 10} \approx -1.63, \quad \frac{N(25) - N(15)}{25 - 15} \approx -1.46, \quad \frac{N(30) - N(1)}{30 - 1} \approx -1.64$$

REF: 061807aii   NAT: F.IF.B.6   TOP: Rate of Change
KEY: AII

125 ANS: 2   REF: 011804aii   NAT: F.TF.A.2   TOP: Determining Trigonometric Functions
KEY: radians

126 ANS: 4   REF: 081622aii   NAT: F.BF.A.1   TOP: Modeling Exponential Functions
KEY: AII

127 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

128 ANS: 3

$$e^{bt} = \frac{c}{a}$$

$$\ln e^{bt} = \ln \frac{c}{a}$$

$$bt \ln e = \ln \frac{c}{a}$$

$$t = \frac{\ln \dfrac{c}{a}}{b}$$

REF: 011813aii   NAT: F.LE.A.4   TOP: Exponential Growth

129 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

130 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

131 ANS: 2

$$S_{20} = \frac{.01 - .01(3)^{20}}{1 - 3} = 17,433,922$$

REF: 011822aii   NAT: A.SSE.B.4   TOP: Series

132 ANS: 4

$$2x - 1 \overline{)10x^3 - 3x^2 - 7x + 3}$$

quotient: $5x^2 + x - 3$

$$\underline{10x^3 - 5x^2}$$
$$2x^2 - 7x$$
$$\underline{2x^2 - x}$$
$$-6x + 3$$
$$\underline{-6x + 3}$$

REF: 011809aii   NAT: A.APR.D.6   TOP: Division of Polynomials

133 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

134 ANS: 1   REF: 011814aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII

135 ANS: 2

$\overline{x} + 2\sigma$ represents approximately 48% of the data.

REF: 061609aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: percent

136 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

137 ANS: 2

$$x + 2 \overline{\smash{\big)}\, x^3 + 2x^2 + x + 6} \quad \overset{\displaystyle x^2 + 0x + 1}{}$$

$$\underline{x^3 + 2x^2}$$

$$0x^2 + x$$

$$\underline{0x^2 + 0x}$$

$$x + 6$$

$$\underline{x + 2}$$

$$4$$

REF: 081611aii   NAT: A.APR.D.6   TOP: Rational Expressions
KEY: division

138 ANS: 3

REF: 081604aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: probability

139 ANS: 3   REF: 011708aii   NAT: F.BF.B.4   TOP: Inverse of Functions
KEY: other

140 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

141 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) $\frac{B(73) - B(60)}{73 - 60} \approx 46\%$
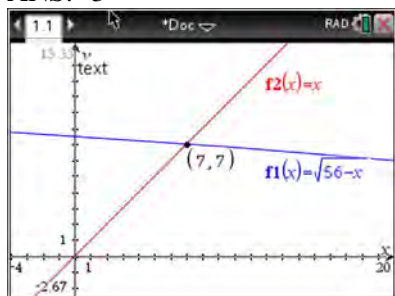
REF: 011721aii   NAT: F.IF.B.6   TOP: Rate of Change
KEY: AII

142 ANS: 4   REF: 081718aii   NAT: F.IF.C.7   TOP: Graphing Trigonometric Functions
KEY: amplitude

143 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

144 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

145 ANS: 4

The vertex is $(1,0)$ and $p = 2$. $y = \dfrac{1}{4(2)}(x-1)^2 + 0$

REF: 061717aii   NAT: G.GPE.A.2   TOP: Graphing Quadratic Functions

146 ANS: 4

$$d = 32(.8)^{b-1} \quad S_n = \frac{32 - 32(.8)^{12}}{1 - .8} \approx 149$$

REF: 081721aii   NAT: A.SSE.B.4   TOP: Series

147 ANS: 4

$$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3 \neq x^3 + 3xy + y^3$$

REF: 081620aii   NAT: A.APR.C.4   TOP: Polynomial Identities

148 ANS: 3   REF: 061710aii   NAT: S.IC.A.2   TOP: Analysis of Data
149 ANS: 1   REF: 081804aii   NAT: F.IF.C.9   TOP: Comparing Functions
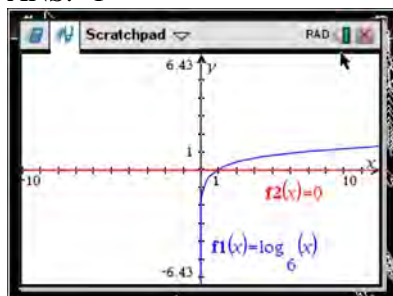150 ANS: 3   REF: 011824aii   NAT: F.BF.A.2   TOP: Sequences
151 ANS: 4

The vertex is $(2,-1)$ and $p = 2$. $y = -\dfrac{1}{4(2)}(x-2)^2 - 1$

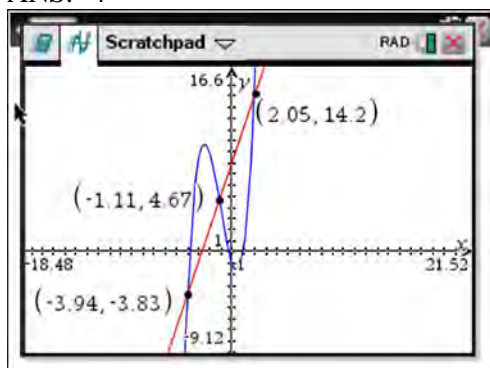REF: 081619aii   NAT: G.GPE.A.2   TOP: Graphing Quadratic Functions

152 ANS: 1

REF: 061618aii　　　NAT: F.IF.C.7　　　TOP: Graphing Logarithmic Functions

153 ANS: 4

REF: 061622aii　　　NAT: A.REI.D.11　TOP: Other Systems
KEY: AII

154 ANS: 4　　　　　REF: 061601aii　　　NAT: N.RN.A.2　　　TOP: Radicals and Rational Exponents
KEY: variables

155 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

156 ANS: 4　　　　　REF: 081624aii　　　NAT: F.BF.A.2　　　TOP: Sequences

157 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: AII

158 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

159 ANS: 1   REF: 081616aii   NAT: F.TF.A.1   TOP: Unit Circle
KEY: bimodalgraph

160 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

161 ANS: 4   REF: 011801aii   NAT: S.IC.B.3   TOP: Analysis of Data
KEY: bias

162 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

163 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: other

164 ANS: 2

REF: 081603aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII

165 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.3   TOP: Analysis of Data
KEY: bias

166 ANS: 2

REF: 061817aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: probability

167 ANS: 3   REF: 011710aii   NAT: F.BF.A.1   TOP: Operations with Functions

168 ANS: 2

$$
\begin{array}{r}
2x^2 - 3x + 7 \\
2x+3 \overline{)\ 4x^3 + 0x^2 + 5x + 10} \\
\underline{4x^3 + 6x^2} \\
-6x^2 + 5x \\
\underline{-6x^2 - 9x} \\
14x + 10 \\
\underline{14x + 21} \\
-11
\end{array}
$$

REF: 061614aii   NAT: A.APR.D.6   TOP: Rational Expressions
KEY: division

169 ANS: 1

$d = 18;\ r = \pm\dfrac{5}{4}$

REF: 011714aii   NAT: F.IF.A.3   TOP: Sequences   KEY: term

170 ANS: 4

$$\ln e^{0.3x} = \ln \frac{5918}{87}$$

$$x = \frac{\ln \dfrac{5918}{87}}{0.3}$$

REF: 081801aii   NAT: F.LE.A.4   TOP: Exponential Equations
KEY: without common base

171 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

172 ANS: 2
The 2010 population is 110 million.

REF: 061718aii   NAT: F.LE.B.5   TOP: Modeling Exponential Functions

173 ANS: 3   REF: 061720aii   NAT: F.LE.A.2   TOP: Sequences
KEY: AII

174 ANS: 2   REF: 081816aii   NAT: F.IF.C.7   TOP: Graphing Logarithmic Functions
KEY: bimodalgraph

175 ANS: 3
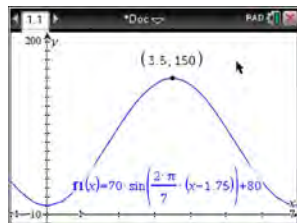
 $H(t)$ is at a minimum at $70(-1) + 80 = 10$

REF: 061613aii   NAT: F.IF.B.4   TOP: Graphing Trigonometric Functions
KEY: maximum/minimum

176 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

177 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

178 ANS: 1

$$\frac{157}{25 + 47 + 157}$$

REF: 081607aii   NAT: S.CP.A.4   TOP: Conditional Probability

179 ANS: 3   REF: 081819aii   NAT: A.REI.D.11   TOP: Other Systems

180 ANS: 4   REF: 081708aii   NAT: A.APR.B.3   TOP: Zeros of Polynomials
     KEY: AII

181 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
     KEY: AII

182 ANS: 2   REF: 081717aii   NAT: S.IC.B.3   TOP: Analysis of Data
     KEY: type

183 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

184 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

185 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

186 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

187 ANS: 2
The vertex of the parabola is (0,0). The distance, p, between the vertex and the focus or the vertex and the
directrix is 1. $y = \frac{-1}{4p}(x - h)^2 + k$

$$y = \frac{-1}{4(1)}(x - 0)^2 + 0$$

$$y = -\frac{1}{4}x^2$$

REF: 081706aii   NAT: G.GPE.A.2   TOP: Graphing Quadratic Functions

188 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

189 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

190 ANS: 2   REF: 011806aii   NAT: A.APR.C.4   TOP: Polynomial Identities

191 ANS: 2   REF: 011701aii   NAT: F.IF.B.4   TOP: Graphing Trigonometric Functions

192 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

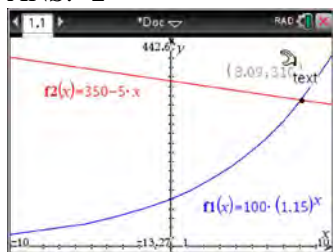193 ANS: 3   REF: 061824aii   NAT: A.CED.A.1   TOP: Modeling Rationals

194 ANS: 3

$$0.75^{\frac{1}{10}} \approx .9716$$

REF: 061713aii   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions
KEY: AII

195 ANS: 2

REF: 011716aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII

196 ANS: 2

$$x^2 + 4x - 1 = x - 3 \quad y + 3 = -1$$
$$x^2 + 3x + 2 = 0 \qquad y = -4$$
$$(x+2)(x+1) = 0$$
$$x = -2, -1$$

REF: 061801aii   NAT: A.REI.C.7   TOP: Quadratic-Linear Systems
KEY: AII

197 ANS: 3

$$1.0525^{\frac{1}{12}} \approx 1.00427$$

REF: 061621aii   NAT: F.BF.A.1   TOP: Modeling Exponential Functions
KEY: AII

198 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

199 ANS: 3   REF: 081618aii   NAT: F.LE.A.2   TOP: Sequences

200 ANS: 3

$$2d(d^3 + 3d^2 - 9d - 27)$$

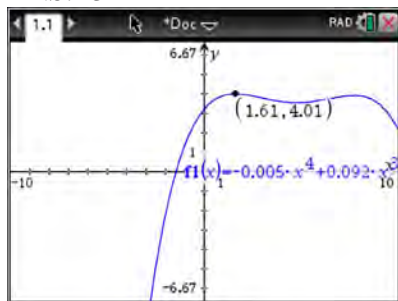$$2d(d^2(d + 3) - 9(d + 3))$$

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

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

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

REF: 081615aii   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: factoring by grouping

201 ANS: 3

REF: 011817aii   NAT: F.IF.B.4   TOP: Graphing Polynomial Functions

202 ANS: 2

$$ME = \left(z\sqrt{\frac{p(1-p)}{n}} \right) = \left(1.96\sqrt{\frac{(0.55)(0.45)}{900}} \right) \approx 0.03$$

REF: 081612aii   NAT: S.IC.B.4   TOP: Analysis of Data

Algebra II 2 Point Regents Exam Questions
Answer Section

203 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

204 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

205 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

206 ANS:

$$\frac{x^3+9}{x^3+8} = \frac{x^3+8}{x^3+8} + \frac{1}{x^3+8}$$

$$\frac{x^3+9}{x^3+8} = \frac{x^3+9}{x^3+8}$$

REF: 061631aii   NAT: A.APR.C.4   TOP: Polynomial Identities

207 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

208 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 Theorem

209 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: Theoretical Probability

210 ANS:

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

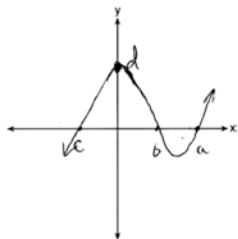REF: 061727aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

211 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
KEY: AII

212 ANS:

REF: 081732aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions
KEY: AII

213 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

214 ANS:
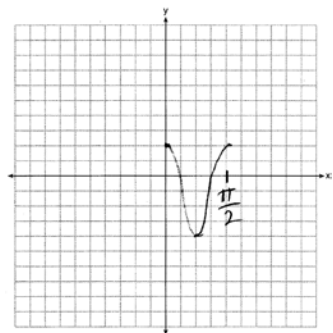
REF: 061628aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

215 ANS:
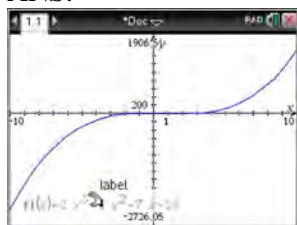
$$2x^2 + 6x + 23$$

$x - 5 \overline{)\; 2x^3 - 4x^2 - 7x - 10}$ Since there is a remainder, $x - 5$ is not a factor.

$$\underline{2x^3 - 10x^2}$$

$$6x^2 - 7x$$

$$\underline{6x^2 - 30x}$$

$$23x - 10$$

$$\underline{23x - 115}$$

$$105$$

REF: 061627aii   NAT: A.APR.B.2   TOP: Remainder Theorem

216 ANS:

$\dfrac{306.25 - 156.25}{70 - 50} = \dfrac{150}{20} = 7.5$ 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: AII

217 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
KEY: AII

218 ANS:

$$3a - 2 \overline{\smash{\big)}\, 6a^3 + 11a^2 - 4a - 9} \quad 2a^2 + 5a + 2 - \frac{5}{3a - 2}$$

with quotient $2a^2 + 5a + 2$

$$\underline{6a^3 - 4a^2}$$
$$15a^2 - 4a$$
$$\underline{15a^2 - 10a}$$
$$6a - 9$$
$$\underline{6a - 4}$$
$$-5$$

REF: 061829aii   NAT: A.APR.D.6   TOP: Division of Polynomials

219 ANS:

$$\sqrt{x - 4} = -x + 6 \qquad \sqrt{x - 4} = -8 + 6 = -2 \text{ is extraneous.}$$
$$x - 4 = x^2 - 12x + 36$$
$$0 = x^2 - 13x + 40$$
$$0 = (x - 8)(x - 5)$$
$$x = 5, 8$$

REF: 061730aii   NAT: A.REI.A.2   TOP: Solving Radicals
KEY: extraneous solutions

220 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

221 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.A.2   TOP: Analysis of Data
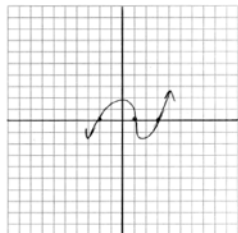
222 ANS:

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

223 ANS:
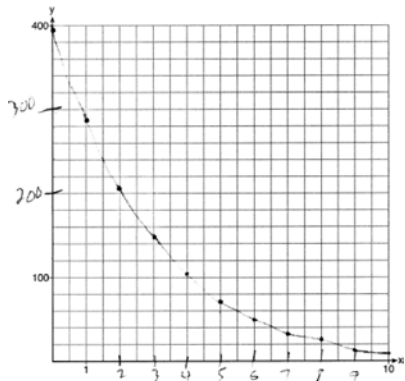
REF: 061729aii   NAT: F.IF.C.7   TOP: Graphing Exponential Functions
KEY: AII

224 ANS:

REF: 011729aii   NAT: F.IF.C.7   TOP: Graphing Polynomial Functions

225 ANS:

$$
\begin{array}{r}
3x+13 \\
x-2\overline{\smash{\big)}\,3x^2+7x-20} \\
\underline{3x^2-6x} \\
13x-20 \\
\underline{13x-26} \\
6
\end{array}
\qquad 3x+13+\frac{6}{x-2}
$$

REF: 011732aii   NAT: A.APR.D.6   TOP: Division of Polynomials

226 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.

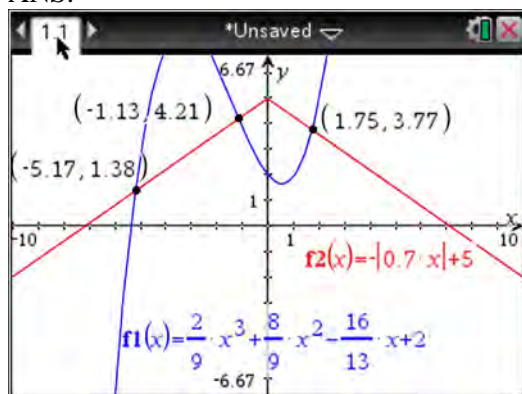REF: 081629aii   NAT: S.IC.B.6   TOP: Analysis of Data

227 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
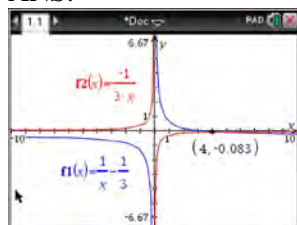KEY: complex solutions | quadratic formula

228 ANS:

REF: fall1510aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII

229 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

230 ANS:

$2(0.042) = 0.084 \approx 0.08$ The percent of users making in-app purchases will be within 4% of 35%.

REF: 081832aii   NAT: S.IC.B.4   TOP: Analysis of Data

231 ANS:

$D = 1.223(2.652)^A$

REF: 011826aii   NAT: S.ID.B.6   TOP: Regression   KEY: exponential AII

232 ANS:

$x = \left(y - 3\right)^3 + 1$

$x - 1 = \left(y - 3\right)^3$

$\sqrt[3]{x - 1} = y - 3$

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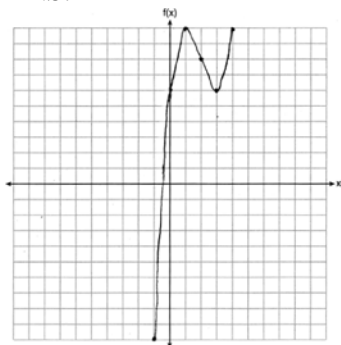
$f^{-1}(x) = \sqrt[3]{x - 1} + 3$

REF: fall1509aii   NAT: F.BF.B.4   TOP: Inverse of Functions
KEY: other

233 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

234 ANS:

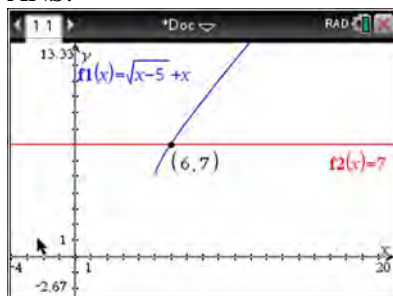REF: 061826aii   NAT: F.IF.C.7   TOP: Graphing Polynomial Functions

235 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.A.2   TOP: Probability of Compound Events
KEY: independence

236 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

237 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

238 ANS:
$\dfrac{p(8)-p(4)}{8-4} \approx 48.78$

REF: 081827aii   NAT: F.IF.B.6   TOP: Rate of Change

239 ANS:
Let x equal the first integer and $x+1$ equal the next. $(x+1)^2 - x^2 = x^2 + 2x + 1 - x^2 = 2x + 1$. $2x+1$ is an odd integer.

REF: fall1511aii   NAT: A.APR.C.4   TOP: Polynomial Identities

240 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.3   TOP: Analysis of Data
KEY: bias

241 ANS:
$8.75 = 1.25x^{49}$ 4

$7 = x^{49}$

$x = \sqrt[49]{7} \approx 1.04$

REF: 081730aii   NAT: F.LE.A.4   TOP: Exponential Growth

242 ANS:

Based on these data, the two events do not appear to be independent. $P(F) = \dfrac{106}{200} = 0.53$, while

$P(F \mid T) = \dfrac{54}{90} = 0.6$, $P(F \mid R) = \dfrac{25}{65} = 0.39$, and $P(F \mid C) = \dfrac{27}{45} = 0.6$. 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

243 ANS:

A student is more likely to jog if both siblings jog. 1 jogs: $\dfrac{416}{2239} \approx 0.19$. both jog: $\dfrac{400}{1780} \approx 0.22$

REF: 061732aii   NAT: S.CP.A.4   TOP: Conditional Probability

244 ANS:

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

REF: 081727aii   NAT: A.APR.C.4   TOP: Polynomial Identities

245 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

246 ANS:

$j(-x) = (-x)^4 - 3(-x)^2 - 4 = x^2 - 3x^2 - 4$ Since $j(x) = j(-x)$, the function is even.

REF: 081731aii   NAT: F.BF.B.3   TOP: Even and Odd Functions

247 ANS:

69

REF: 061726aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: percent

248 ANS:

$$A = Pe^{rt}$$

$$135000 = 100000e^{5r}$$

$$1.35 = e^{5r}$$

$$\ln 1.35 = \ln e^{5r}$$

$$\ln 1.35 = 5r$$

$$.06 \approx r \text{ or } 6\%$$

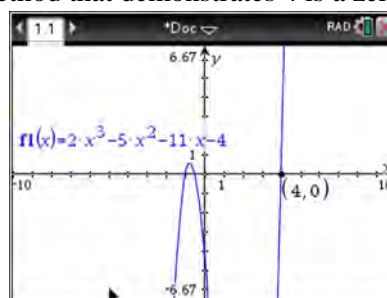REF: 061632aii   NAT: F.LE.A.4   TOP: Exponential Growth

249 ANS:

$$\frac{\left(\ln \frac{1}{2}\right)}{1590}$$ is negative, so $M(t)$ represents decay.

REF: 011728aii   NAT: F.IF.C.7   TOP: Graphing Exponential Functions

250 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 Theorem

251 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

252 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: A.SSE.B.4   TOP: Series

253 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

254 ANS:

$$\frac{1}{8} + \frac{1}{6} = \frac{1}{t_b}; \quad \frac{24t_b}{8} + \frac{24t_b}{6} = \frac{24t_b}{t_b}$$

$$3t_b + 4t_b = 24$$

$$t_b = \frac{24}{7} \approx 3.4$$

REF: 011827aii   NAT: A.CED.A.1   TOP: Modeling Rationals

255 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 $y = \sin \theta$,
$\csc \theta = \frac{1}{y}$.

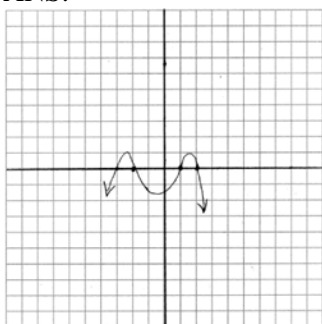REF: 011727aii   NAT: F.TF.A.2   TOP: Reciprocal Trigonometric Relationships

256 ANS:
No, because $P(M / R) \neq P(M)$

$$\frac{70}{180} \neq \frac{230}{490}$$
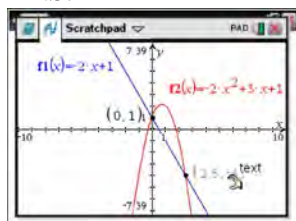
$$0.38 \neq 0.47$$

REF: 011731aii   NAT: S.CP.A.4   TOP: Conditional Probability

257 ANS:

REF: 011831aii   NAT: F.IF.C.7   TOP: Graphing Polynomial Functions

258 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
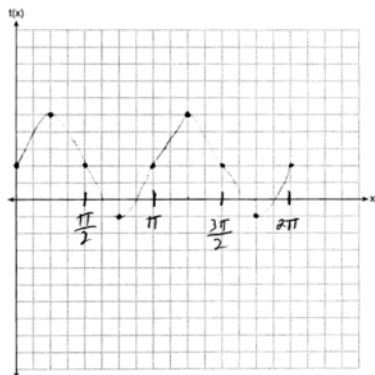KEY: AII

259 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

260 ANS:

REF: 081830aii   NAT: F.IF.C.7   TOP: Graphing Trigonometric Functions
KEY: graph

261 ANS:

$$\frac{103}{110+103}=\frac{103}{213}$$

REF: 061825aii   NAT: S.CP.A.4   TOP: Conditional Probability

262 ANS:

$i^2 = -1$, and not 1; $10 + 10i$

REF: 011825aii   NAT: N.CN.A.2   TOP: Operations with Complex Numbers

263 ANS:

$xi(-6i)^2 = xi(36i^2) = 36xi^3 = -36xi$

REF: 081627aii   NAT: N.CN.A.2   TOP: Operations with Complex Numbers

264 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

265 ANS:

$$\left(x^2 - 6\right)\left(x^2 + 2\right)$$

REF: 081825aii   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: higher power

13

266 ANS:

Rewrite $\dfrac{4}{3}$ as $\dfrac{1}{3} \cdot \dfrac{4}{1}$, using the power of a power rule.

REF: 081725aii   NAT: N.RN.A.1   TOP: Radicals and Rational Exponents
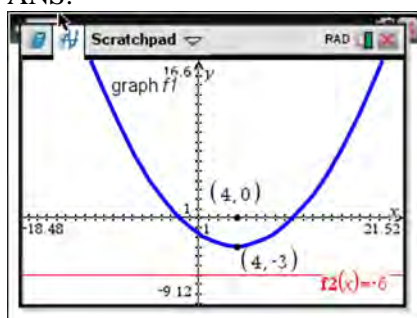
267 ANS:

$\sin^2\theta + (-0.7)^2 = 1$ Since θ is in Quadrant II, $\sin\theta = \sqrt{.51}$ and $\tan\theta = \dfrac{\sin\theta}{\cos\theta} = \dfrac{\sqrt{.51}}{-0.7} \approx -1.02$

$\qquad\qquad \sin^2\theta = .51$

$\qquad\qquad \sin\theta = \pm\sqrt{.51}$

REF: 081628aii   NAT: F.TF.C.8   TOP: Determining Trigonometric Functions

268 ANS:

 The vertex of the parabola is $(4,-3)$. The x-coordinate of the focus and the vertex is the same. Since the distance from the vertex to the directrix is 3, the distance from the vertex to the focus is 3, so the y-coordinate of the focus is 0. The coordinates of the focus are $(4,0)$.

REF: 061630aii   NAT: G.GPE.A.2   TOP: Graphing Quadratic Functions

269 ANS:

$20e^{.05t} = 30e^{.03t}$

$\dfrac{\dfrac{2}{3}e^{.05t}}{e^{.05t}} = \dfrac{e^{.03t}}{e^{.05t}}$

$\ln\dfrac{2}{3} = \ln e^{-.02t}$

$\ln\dfrac{2}{3} = -.02t\ln e$

$\dfrac{\ln\dfrac{2}{3}}{-.02} = t$

$20.3 \approx t$

REF: 011829aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII

270 ANS:

$a_1 = 3$ $a_2 = 7$ $a_3 = 15$ $a_4 = 31$; No, because there is no common ratio: $\dfrac{7}{3} \neq \dfrac{15}{7}$

REF: 061830aii   NAT: F.IF.A.3   TOP: Sequences   KEY: term

271 ANS:

$a_1 = 4$ $a_8 = 639$

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

REF: 081729aii   NAT: F.LE.A.2   TOP: Sequences

272 ANS:

$$\dfrac{x^{\frac{8}{3}}}{x^{\frac{4}{3}}} = x^y$$

$$x^{\frac{4}{3}} = x^y$$

$$\dfrac{4}{3} = y$$

REF: spr1505aii   NAT: N.RN.A.2   TOP: Radicals and Rational Exponents
KEY: numbers

273 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
KEY: type

274 ANS:

$1200 \cdot 0.784 \approx 941$

REF: 081828aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: predict

275 ANS:

$$\sqrt[3]{x} \bullet \sqrt{x} = x^{\frac{1}{3}} \bullet x^{\frac{1}{2}} = x^{\frac{3}{6}} \bullet x^{\frac{3}{6}} = x^{\frac{5}{6}}$$

REF: 061731aii   NAT: N.RN.A.2   TOP: Operations with Radicals
KEY: with variables, index > 2

276 ANS:

$$P(W/D) = \dfrac{P(W \wedge D)}{P(D)} = \dfrac{.4}{.5} \approx .8$$

REF: 081726aii   NAT: S.CP.B.6   TOP: Conditional Probability

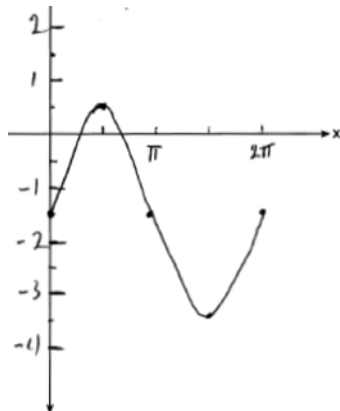**Algebra II 4 Point Regents Exam Questions**
Answer Section

277 ANS:

$a_n = x^{n-1}(x+1)$ $x^{n-1} = 0$ $x + 1 = 0$

$$x = 0 \qquad x = -1$$

REF: spr1511aii NAT: F.BF.A.2 TOP: Sequences

278 ANS:

Part a sketch is shifted $\dfrac{\pi}{3}$ units right.

REF: 081735aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

279 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

280 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.B.6 TOP: Conditional Probability

281 ANS:

$$7 = 20(0.5)^{\frac{t}{8.02}}$$

$$\log 0.35 = \log 0.5^{\frac{t}{8.02}}$$

$$\log 0.35 = \frac{t \log 0.5}{8.02}$$

$$\frac{8.02 \log 0.35}{\log 0.5} = t$$

$$t \approx 12$$

REF: 081634aii   NAT: F.LE.A.4   TOP: Exponential Decay

282 ANS:

$$\left(\sqrt{2x-7}\right)^2 = (5-x)^2 \qquad \sqrt{2(4)-7}+4=5 \quad \sqrt{2(8)-7}+8=5$$

$$2x - 7 = 25 - 10x + x^2 \qquad\qquad \sqrt{1} = 1 \qquad\qquad \sqrt{9} \neq -3$$
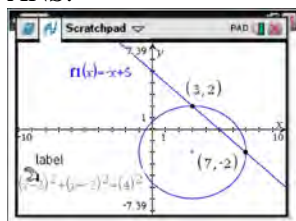
$$0 = x^2 - 12x + 32$$

$$0 = (x-8)(x-4)$$

$$x = 4, 8$$

REF: 081635aii   NAT: A.REI.A.2   TOP: Solving Radicals
KEY: extraneous solutions

283 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
KEY: AII

284 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

$6x^2 - 11x + 3 = 0$

$(2x - 3)(3x - 1) = 0$

$$x = \frac{3}{2}, \frac{1}{3}, -5$$

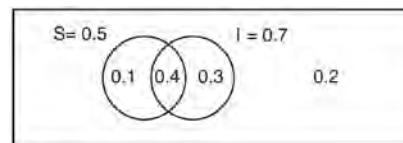REF: fall1515aii   NAT: A.APR.B.2   TOP: Remainder Theorem

285 ANS:

$C(t) = 63000\left(1 + \dfrac{0.0255}{12}\right)^{12t} \quad 63000\left(1 + \dfrac{0.0255}{12}\right)^{12t} = 100000$

$$12t \log(1.002125) = \log\frac{100}{63}$$

$$t \approx 18.14$$

REF: 061835aii   NAT: A.CED.A.1   TOP: Exponential Growth

286 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.A.2   TOP: Probability of Compound Events
KEY: independence

287 ANS:

$2 = e^{0.0375t}$

$t \approx 18.5$

REF: 081835aii   NAT: F.LE.A.4   TOP: Exponential Growth

288 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 $j(x)$;

$2x^3 - 3x^2 - 32x + 48 = 0$

$x^2(2x - 3) - 16(2x - 3) = 0$

$(x^2 - 16)(2x - 3) = 0$

$$x = \pm 4, \frac{3}{2}$$

REF: 081834aii   NAT: A.APR.B.2   TOP: Remainder Theorem

289 ANS:

$$\frac{47}{108} = \frac{1}{4} + \frac{116}{459} - P(M \text{ and } J); \text{ No, because } \frac{31}{459} \neq \frac{1}{4} \cdot \frac{116}{459}$$

$P(M \text{ and } J) = \dfrac{31}{459}$

REF: 011834aii   NAT: S.CP.A.3   TOP: Conditional Probability

290 ANS:

$f(x) = x^2(x + 4)(x - 3);$ $g(x) = (x + 2)^2(x + 6)(x - 1)$

REF: 011836aii   NAT: A.APR.B.3   TOP: Zeros of Polynomials

291 ANS:

$23 - 18 = 5,$ $\overline{x} \pm 2\sigma = -3.07 - 3.13,$ Yes, a difference of 5 or more occurred three times out of a thousand, which is statistically significant.

REF: 061834aii   NAT: S.IC.B.5   TOP: Analysis of Data

292 ANS:

$0.506 \pm 2 \cdot 0.078 = 0.35 - 0.66.$ The 32.5% value falls below the 95% confidence level.

REF: 061736aii   NAT: S.IC.B.5   TOP: Analysis of Data

293 ANS:

$\dfrac{6.25 - 2.25}{21 - 5} = \dfrac{4}{16} = \$.25$ fine per day. $2.25 - 5(.25) = \$1$ replacement fee. $a_n = 1.25 + (n - 1)(.25).$ $a_{60} = \$16$

REF: 081734aii   NAT: F.LE.A.2   TOP: Sequences

294 ANS:

$$\sqrt{6-2x} + x = 2x + 30 - 9 \qquad \sqrt{6-2(-29)} \ne -29 + 21, \text{ so } -29 \text{ is extraneous.}$$
$$\sqrt{6-2x} = x + 21 \qquad \qquad \sqrt{64} \ne -8$$
$$6 - 2x = x^2 + 42x + 441$$
$$x^2 + 44x + 435 = 0$$
$$(x + 29)(x + 15) = 0$$
$$x = -29, -15$$

REF: 061833aii   NAT: A.REI.A.2   TOP: Solving Radicals
KEY: extraneous solutions

295 ANS:
$$2x^3 - 10x^2 + 11x - 7 = 2x^3 + hx^2 + 3x - 8x^2 - 4hx - 12 + k \quad h = -2$$
$$-2x^2 + 8x + 5 = hx^2 - 4hx + k \qquad\qquad k = 5$$

REF: 011733aii   NAT: A.APR.C.4   TOP: Polynomial Identities

296 ANS:
The mean difference between the students' final grades in group 1 and group 2 is –3.64. This value indicates that students who met with a tutor had a mean final grade of 3.64 points less than students who used an on-line subscription. One can infer whether this difference is due to the differences in intervention or due to which students were assigned to each group by using a simulation to rerandomize the students' final grades many (500) times. If the observed difference –3.64 is the result of the assignment of students to groups alone, then a difference of –3.64 or less should be observed fairly regularly in the simulation output. However, a difference of –3 or less occurs in only about 2% of the rerandomizations. Therefore, it is quite unlikely that the assignment to groups alone accounts for the difference; rather, it is likely that the difference between the interventions themselves accounts for the difference between the two groups' mean final grades.

REF: fall1514aii   NAT: S.IC.B.5   TOP: Analysis of Data

297 ANS:
$$4x + 6y - 8z = -2 \quad 4x - 8y + 20z = 12 \quad z + 2 = 3z - 4 \quad y = 3 + 2 = 5 \quad -4x + 5 + 3 = 16$$
$$\underline{-4x + y + z = 16} \quad \underline{-4x + y + z = 16} \qquad 6 = 2z \qquad\qquad\qquad\qquad -4x = 8$$
$$7y - 7z = 14 \qquad -7y + 21z = 28 \qquad z = 3 \qquad\qquad\qquad\qquad x = -2$$
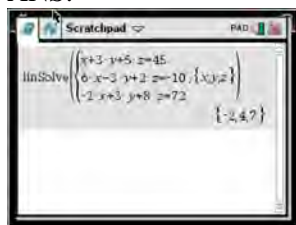$$y - z = 2 \qquad\qquad y - 3z = -4$$
$$y = z + 2 \qquad\qquad y = 3z - 4$$

REF: 081833aii   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: three variables

298 ANS:

$$6x - 3y + 2z = -10 \quad x + 3y + 5z = 45 \quad 4x + 10z = 62 \quad 4x + 4(7) = 20$$

$$-2x + 3y + 8z = 72 \quad 6x - 3y + 2z = -10 \quad 4x + 4z = 20 \quad 4x = -8$$

$$4x + 10z = 62 \quad 7x + 7z = 35 \quad 6z = 42 \quad x = -2$$

$$4x + 4z = 20 \quad z = 7$$

$$6(-2) - 3y + 2(7) = -10$$

$$-3y = -12$$

$$y = 4$$

REF: spr1510aii   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: three variables

299 ANS:

John found the means of the scores of the two rooms and subtracted the means. The mean score for the classical room was 7 higher than the rap room (82-75). Yes, there is less than a 5% chance this difference occurring due to random chance. It is likely the difference was due to the music.

REF: 081836aii   NAT: S.IC.B.5   TOP: Analysis of Data

300 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

301 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, $\left(\sqrt{\dfrac{p(1-p)}{n}}\right) \; or \; \left(\sqrt{\dfrac{(0.25)(0.75)}{50}}\right)$

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.B.4   TOP: Analysis of Data

302 ANS:
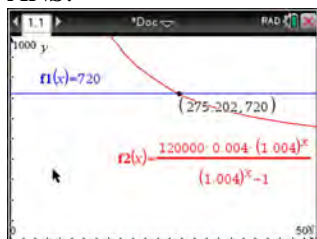
$$720 = \dfrac{120000\left(\dfrac{.048}{12}\right)\left(1 + \dfrac{.048}{12}\right)^n}{\left(1 + \dfrac{.048}{12}\right)^n - 1} \quad \dfrac{275.2}{12} \approx 23 \text{ years}$$

$$720(1.004)^n - 720 = 480(1.004)^n$$

$$240(1.004)^n = 720$$

$$1.004^n = 3$$

$$n \log 1.004 = \log 3$$

$$n \approx 275.2 \text{ months}$$

REF: spr1509aii   NAT: A.CED.A.1   TOP: Exponential Growth

303 ANS:

$\text{normcdf}(510, 540, 480, 24) = 0.0994$ $z = \dfrac{510 - 480}{24} = 1.25$ $1.25 = \dfrac{x - 510}{20}$ $2.5 = \dfrac{x - 510}{20}$ 535-560

$$z = \dfrac{540 - 480}{24} = 2.5 \qquad x = 535 \qquad x = 560$$

REF: fall1516aii   NAT: S.ID.A.4   TOP: Normal Distributions
KEY: probability

304 ANS:

Some of the students who did not drink energy drinks read faster than those who did drink energy drinks.

$17.7 - 19.1 = -1.4$ Differences of -1.4 and less occur $\dfrac{25}{232}$ or about 10% of the time, so the difference is not unusual.

REF: 081636aii   NAT: S.IC.B.5   TOP: Analysis of Data

305 ANS:

$\dfrac{f(4) - f(-2)}{4 - -2} = \dfrac{80 - 1.25}{6} = 13.125$ $g(x)$ has a greater rate of change

$$\dfrac{g(4) - g(-2)}{4 - -2} = \dfrac{179 - -49}{6} = 38$$

REF: 061636aii   NAT: F.IF.C.9   TOP: Comparing Functions
KEY: AII

306 ANS:

$$S_n = \frac{33000 - 33000(1.04)^n}{1 - 1.04} \quad S_{15} = \frac{33000 - 33000(1.04)^{15}}{1 - 1.04} \approx 660778.39$$

REF: 061634aii   NAT: A.SSE.B.4   TOP: Series

307 ANS:

$$x + y + z = 1 \quad\quad 2x + 2y + 2z = 2 \quad -2z - z = 3 \quad y - (-1) = 3 \quad x + 2 - 1 = 1$$

$$\underline{-x + 3y - 5z = 11} \quad \underline{2x + 4y + 6z = 2} \quad -3z = 3 \quad\quad y = 2 \quad\quad\quad\quad x = 0$$

$$4y - 4z = 12 \quad\quad\quad 2y + 4z = 0 \quad\quad z = -1$$

$$y - z = 3 \quad\quad\quad\quad y + 2z = 0$$

$$y = -2z$$

REF: 061733aii   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: three variables

308 ANS:

$\dfrac{h(2) - h(1)}{2 - 1} = -12$, $h(t) = 0$ 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

309 ANS:

Jillian's plan, because distance increases by one mile each week. $a_1 = 10 \quad\quad a_n = n + 12$

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

REF: 011734aii   NAT: F.LE.A.2   TOP: Sequences

310 ANS:

$y = 4.168(3.981)^x$. $100 = 4.168(3.981)^x$

$$\log\frac{100}{4.168} = \log(3.981)^x$$

$$\log\frac{100}{4.168} = x\log(3.981)$$

$$\frac{\log\dfrac{100}{4.168}}{\log(3.981)} = x$$

$$x \approx 2.25$$

REF: 081736aii   NAT: S.ID.B.6   TOP: Regression   KEY: exponential AII

311 ANS:

$$M = 172600 \bullet \frac{0.00305(1+0.00305)^{12\cdot 15}}{(1+0.00305)^{12\cdot 15}-1} \approx 1247 \qquad 1100 = (172600 - x) \bullet \frac{0.00305(1+0.00305)^{12\cdot 15}}{(1+0.00305)^{12\cdot 15}-1}$$

$$1100 \approx (172600 - x) \bullet (0.007228)$$

$$152193 \approx 172600 - x$$

$$20407 \approx x$$

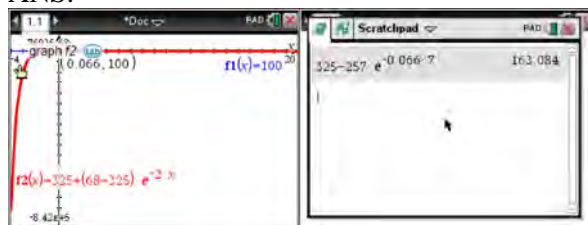REF: 061734aii   NAT: A.SSE.B.4   TOP: Series

312 ANS:

$$20000 = PMT\left(\frac{1-(1+.00625)^{-60}}{0.00625}\right) \quad 21000 - x = 300\left(\frac{1-(1+.00625)^{-60}}{0.00625}\right)$$

$$PMT \approx 400.76 \qquad\qquad\qquad x \approx 6028$$

REF: 011736aii   NAT: A.SSE.B.4   TOP: Series

313 ANS:

$$100 = 325 + (68-325)e^{-2k} \quad T = 325 - 257e^{-0.066t}$$

$$-225 = -257e^{-2k} \qquad\qquad T = 325 - 257e^{-0.066(7)} \approx 163$$

$$k = \frac{\ln\left(\dfrac{-225}{-257}\right)}{-2}$$

$$k \approx 0.066$$

REF: fall1513aii   NAT: F.LE.A.4   TOP: Exponential Growth

314 ANS:
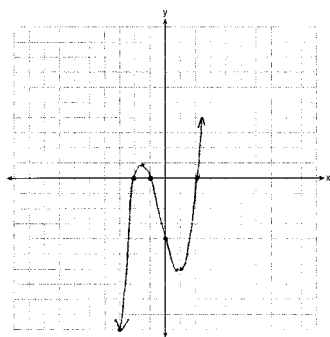
$0 = x^2(x+1) - 4(x+1)$

$0 = (x^2 - 4)(x+1)$

$0 = (x+2)(x-2)(x+1)$

$x = -2, -1, 2$

REF: 081633aii   NAT: F.IF.C.7   TOP: Graphing Polynomial Functions

315 ANS:
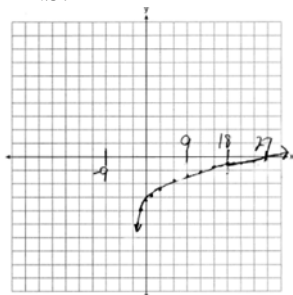
As $x \to -3, y \to -\infty$. As $x \to \infty, y \to \infty$.

REF: 061735aii   NAT: F.IF.C.7   TOP: Graphing Logarithmic Functions

316 ANS:

$138.905 \pm 2 \cdot 7.95 = 123 - 155$. No, since 125 (50% of 250) falls within the 95% interval.
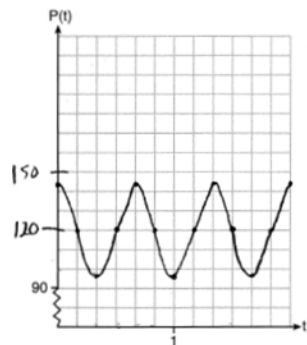
REF: 011835aii   NAT: S.IC.A.2   TOP: Analysis of Data

317 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.B.5   TOP: Analysis of Data

Algebra II 6 Point Regents Exam Questions
Answer Section

318 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

319 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
KEY: AII

320 ANS:

$A = 5000(1.045)^n$ $5000\left(1 + \dfrac{.046}{4}\right)^{4(6)} - 5000(1.045)^6 \approx 6578.87 - 6511.30 \approx 67.57$ $10000 = 5000\left(1 + \dfrac{.046}{4}\right)^{4n}$

$B = 5000\left(1 + \dfrac{.046}{4}\right)^{4n}$

$2 = 1.0115^{4n}$
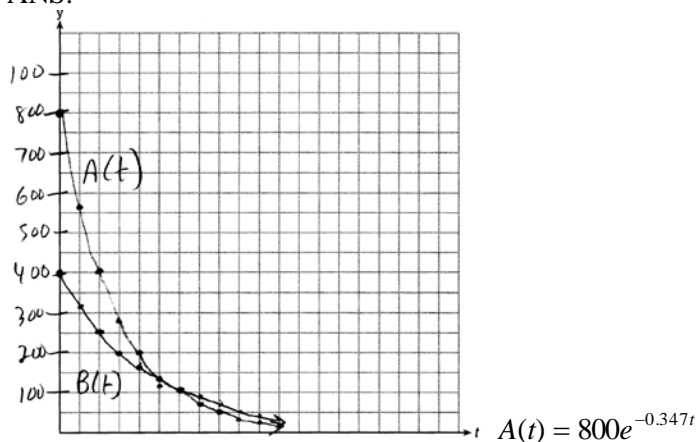
$\log 2 = 4n \cdot \log 1.0115$

$n = \dfrac{\log 2}{4 \log 1.0115}$

$n \approx 15.2$

REF: 081637aii   NAT: A.CED.A.1   TOP: Exponential Growth

321 ANS:

$A(t) = 800e^{-0.347t}$ $800e^{-0.347t} = 400e^{-0.231t}$ $0.15 = e^{-0.347t}$

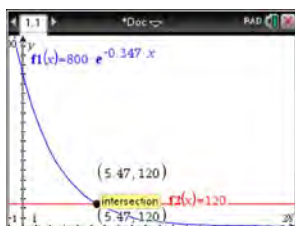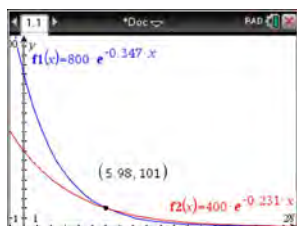$B(t) = 400e^{-0.231t}$ $\ln 2e^{-0.347t} = \ln e^{-0.231t}$ $\ln 0.15 = \ln e^{-0.347t}$

$\ln 2 + \ln e^{-0.347t} = \ln e^{-0.231t}$ $\ln 0.15 = -0.347t \cdot \ln e$
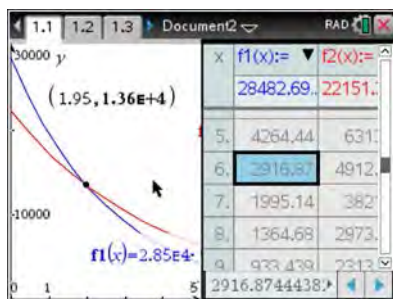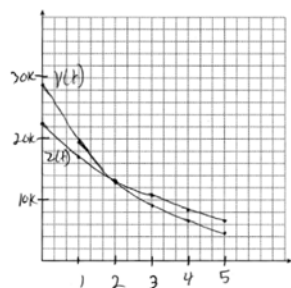
$\ln 2 - 0.347t = -0.231t$ $5.5 \approx t$

$\ln 2 = 0.116t$

$6 \approx t$

REF: 061637aii   NAT: A.REI.D.11   TOP: Other Systems
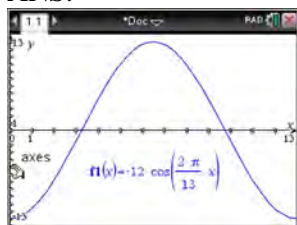KEY: AII

322 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: AII

323 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 $P = \dfrac{2\pi}{B}$ (where P is the period), it is determined that $B = \dfrac{2\pi}{13}$.
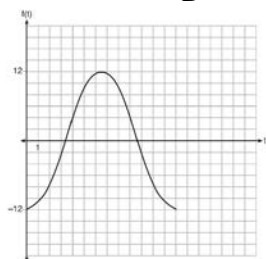


$f(t) = -12\cos\left(\dfrac{2\pi}{13} t\right)$

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

324 ANS:
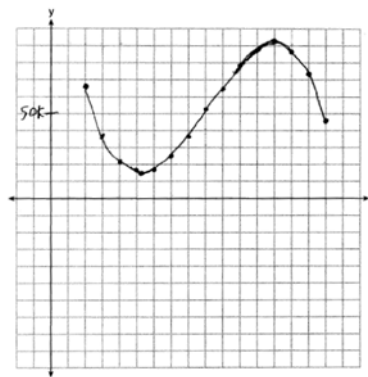
$P(x) = R(x) - C(x) = -330x^3 + 9000x^2 - 67000x + 167000$ Least profitable at year 5 because there is a minimum in $P(x)$. Most profitable at year 13 because there is a maximum in $P(x)$.

REF: 081837aii   NAT: F.IF.C.7   TOP: Graphing Polynomial Functions

325 ANS:

$$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}} \quad \log\frac{100}{140} = \log\left(\frac{1}{2}\right)^{\frac{5}{h}} \qquad\qquad 40 = 140\left(\frac{1}{2}\right)^{\frac{t}{10.3002}}$$

$$\log\frac{5}{7} = \frac{5}{h}\log\frac{1}{2} \qquad\qquad \log\frac{2}{7} = \log\left(\frac{1}{2}\right)^{\frac{t}{10.3002}}$$

$$h = \frac{5\log\frac{1}{2}}{\log\frac{5}{7}} \approx 10.3002 \qquad\qquad \log\frac{2}{7} = \frac{t\log\left(\frac{1}{2}\right)}{10.3002}$$

$$t = \frac{10.3002\log\frac{2}{7}}{\log\frac{1}{2}} \approx 18.6$$

REF: 061737aii   NAT: F.LE.A.4   TOP: Exponential Decay

326 ANS:

$$0 = \sqrt{t} - 2t + 6 \quad 2\left(\frac{9}{4}\right) - 6 < 0, \text{ so } \frac{9}{4} \text{ is extraneous.}$$

$$2t - 6 = \sqrt{t}$$

$$4t^2 - 24t + 36 = t$$
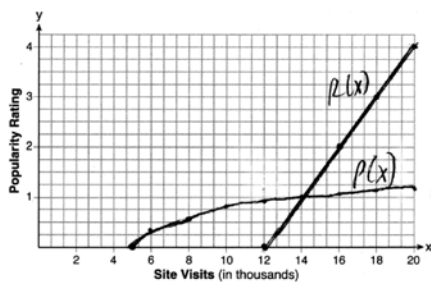
$$4t^2 - 25t + 36 = 0$$

$$(4t - 9)(t - 4) = 0$$

$$t = \frac{9}{4}, 4$$

$$(\sqrt{1} - 2(1) + 6) - (\sqrt{3} - 2(3) + 6) = 5 - \sqrt{3} \approx 3.268 \quad 327 \text{ mph}$$

REF: 011737aii   NAT: A.REI.A.2   TOP: Solving Radicals
KEY: context

327 ANS:

$P(16) = \log(16 - 4) \approx 1.1,$, 14000

REF: 061837aii   NAT: A.REI.D.11   TOP: Other Systems
KEY: AII