## Algebra II Regents Bimodal Worksheets

1   After Roger's surgery, his doctor administered pain medication in the following amounts in milligrams over four days.

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

How can this sequence best be modeled recursively?

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

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

$R$ = monthly payment
$P$ = loan amount
$i$ = monthly interest rate
$t$ = time, in months

Robert's monthly payment will be

3   A culture of 1000 bacteria triples every 10 hours. Which expression models the number of bacteria in the sample after $t$ hours?

4   Functions $f$ and $g$ are given below.
$$f(x) = \frac{7}{2}x^2 - 5x + 11$$
$$g(x) = 3x^2 - 7x + 25$$
When $2f(x)$ is subtracted from $g(x)$, the result is

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

6   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?

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

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

9   The temperature, in degrees Fahrenheit, in Times Square during a day in August can be predicted by the function $T(x) = 8\sin(0.3x - 3) + 74$, where $x$ is the number of hours after midnight.  According to this model, the predicted temperature, to the *nearest degree* Fahrenheit, at 7 P.M. is

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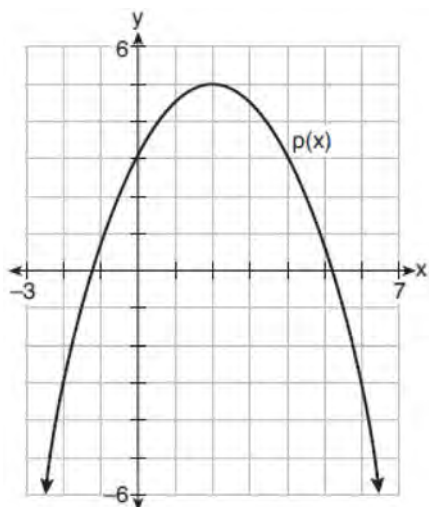$$\frac{\sqrt[3]{x^2} \bullet \sqrt{x^5}}{\sqrt[6]{x}}?$$

Name: _____

11 Which value, to the *nearest tenth*, is an approximate solution for the equation $f(x) = g(x)$, if $f(x) = \dfrac{5}{x-3}$ and $g(x) = 2(1.3)^x$?

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

13 Consider the probability statements regarding events $A$ and $B$ below.

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

What is $P(B)$?

14 A research assistant receives a first year salary of $90,000 and a 2% annual raise throughout the first ten years of employment. In total, how much money will be earned over the first ten years, to the *nearest dollar*?

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

16 What is the quotient when $10x^3 - 3x^2 - 7x + 3$ is divided by $2x - 1$?

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

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

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

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

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

21 The height above ground for a person riding a Ferris wheel after $t$ seconds is modeled by

$$h(t) = 150\sin\left(\frac{\pi}{45}t + 67.5\right) + 160 \text{ feet. How many}$$

seconds does it take to go from the bottom of the wheel to the top of the wheel?

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

23 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

24 What is the focus of the parabola $8(y+2) = (x+5)^2$?

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

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

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

26 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?

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



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

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

29 At her job, Pat earns $25,000 the first year and receives a raise of $1000 each year. The explicit formula for the $n$th term of this sequence is $a_n = 25,000 + (n-1)1000$. Which rule best represents the equivalent recursive formula?

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

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

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

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

32 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?

33 The equation of the parabola that has its focus at the point $(-3, 2)$ and directrix at $y = 0$ is

34 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

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

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

37 The solutions to the equation $5x^2 - 2x + 13 = 9$ are

38 Given $\cos \theta = \dfrac{7}{25}$, where $\theta$ is an angle in standard position terminating in quadrant IV, and $\sin^2 \theta + \cos^2 \theta = 1$, what is the value of $\tan \theta$?

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

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

41 There are 400 students in the senior class at Oak Creek High School. All of these students took the SAT. The distribution of their SAT scores is approximately normal. The number of students who scored within 2 standard deviations of the mean is approximately

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

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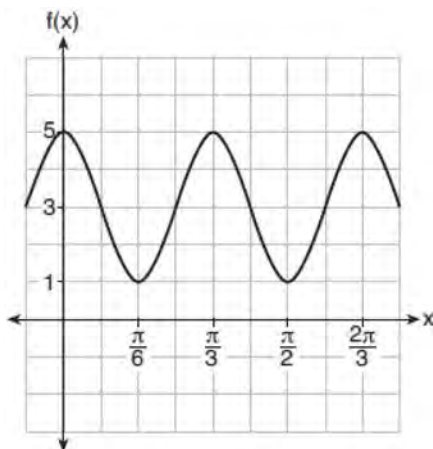


What are the values of $a$, $b$, and $c$?

44 To prepare for lacrosse tryouts, Kole is increasing the amount of time he spends at the gym. This week he is spending 150 minutes there and he plans to increase this amount by 2% each week. The amount of time, in minutes, that he plans to spend at the gym $t$ weeks from now is given by the function $A(t) = 150(1.02)^t$. In terms of a daily growth rate, the amount of time Kole is planning to spend at the gym can best be modeled by the function

45 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

46 The expression $\dfrac{9x^2 - 2}{3x + 1}$ is equivalent to

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

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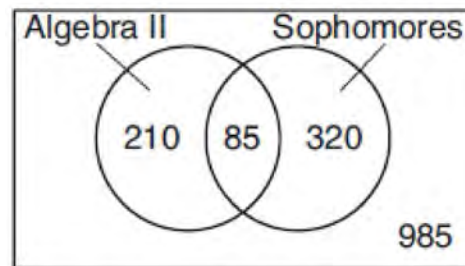


If a student from the high school is selected at random, what is the probability that the student is a sophomore given that the student is enrolled in Algebra II?

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

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

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

52 The terminal side of $\theta$, 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 $\sec \theta$?

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

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

55 Which expression is equivalent to
$(2x - i)^2 - (2x - i)(2x + 3i)$ where $i$ is the imaginary unit and $x$ is a real number?

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

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

58 Which expression(s) are equivalent to $\dfrac{x^2 - 4x}{2x}$, where $x \neq 0$?

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

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

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

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

60 If $f(x) = \sqrt[3]{x} + 4$, then $f^{-1}(x)$ equals

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

62 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?

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

64 What is the solution set for $x$ in the equation below?
$$\sqrt{x + 1} - 1 = x$$

65 The completely factored form of
$n^4 - 9n^2 + 4n^3 - 36n - 12n^2 + 108$ is

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

67 If $5000 is put into a savings account that pays 3.5% interest compounded monthly, how much money, to the *nearest ten cents*, would be in that account after 6 years, assuming no money was added or withdrawn?

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

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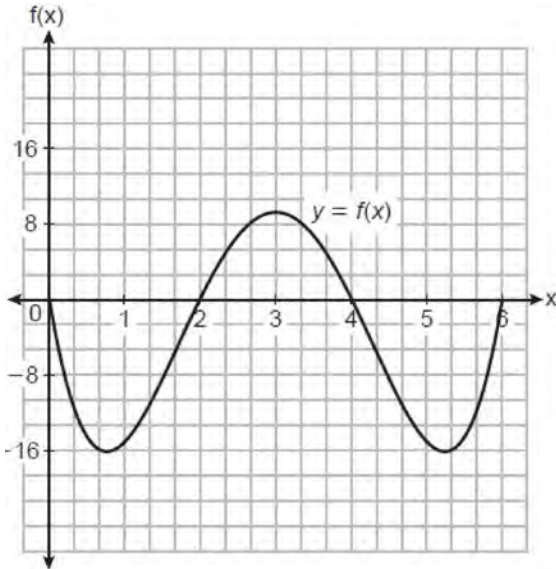


If this trail has a minimum height of 16 feet below sea level, which function(s) could represent a running trail whose minimum height is half of the minimum height of the original trail?

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

70  For the function $d(x) = \sqrt[3]{x+2}$, the inverse function, $d^{-1}(x)$, equals

71  If $p(x) = 2\ln(x) - 1$ and $m(x) = \ln(x+6)$, then what is the solution for $p(x) = m(x)$?

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

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

74  Which expression is equivalent to $\dfrac{6x^4 + 4x^3 + x + 200}{x+2}$?

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

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

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

78  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?

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

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

    Which statement is best supported by the data?

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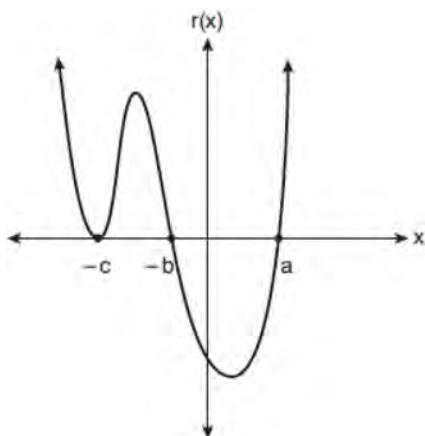


    An equation for $r(x)$ could be

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

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

83  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?

84  Which point is in Quadrant III and is a solution to
    the system below?
    $$y = x^2 - 24$$
    $$y = x - 12$$

85  Which equation represents the equation of the
    parabola with focus $(-3,3)$ and directrix $y = 7$?

86  For the system shown below, what is the value of
    $z$?
    $$y = -2x + 14$$
    $$3x - 4z = 2$$
    $$3x - y = 16$$

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

88 The scores on a mathematics college-entry exam are normally distributed with a mean of 68 and standard deviation 7.2. Students scoring higher than one standard deviation above the mean will not be enrolled in the mathematics tutoring program. How many of the 750 incoming students can be expected to be enrolled in the tutoring program?

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

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

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

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

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

94 What is the solution set of the equation $\dfrac{2}{3x+1} = \dfrac{1}{x} - \dfrac{6x}{3x+1}$?

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

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

97 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?

98 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?

99 If $f(x) = \log_3 x$ and $g(x)$ is the image of $f(x)$ after a translation five units to the left, which equation represents $g(x)$?

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

101 Mr. Zachary posts review assignments on the Betamath website for his students. On his last test, 49% of his students used Betamath and passed. Overall, 68% of his students used Betamath. Approximately what percentage of Mr. Zachary's students passed, given that they used Betamath?

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

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

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

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

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

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

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

105   Which statements must be true about the polynomial function $k(x) = -2x^3 - 11x^2 - 12x + 9$?
       I. $(x - 3)$ is a factor of $k(x)$
       II. $k(0) = 9$
       III. $\dfrac{k(x)}{x + 2}$ has a remainder of 5

106   A number, minus twenty times its reciprocal, equals eight.  The number is

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

108   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

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

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

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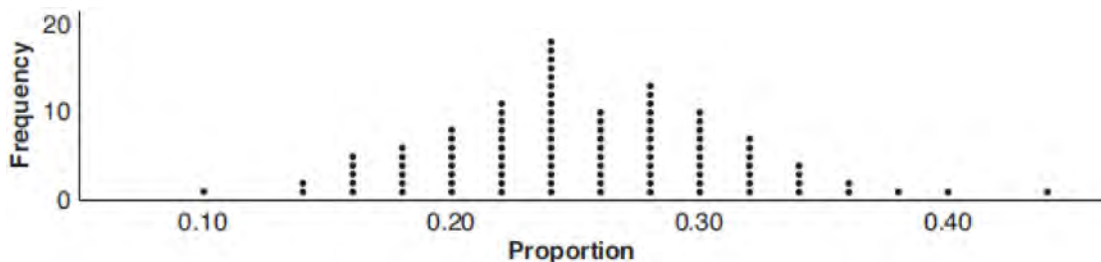


The simulation results in a mean of 0.254 and a standard deviation of 0.060.  Based on this simulation, what is a plausible interval containing the middle 95% of the data?

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

113   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

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

115   If $\cos\theta = -\dfrac{3}{4}$ and $\theta$ is in Quadrant III, then $\sin\theta$ is equivalent to

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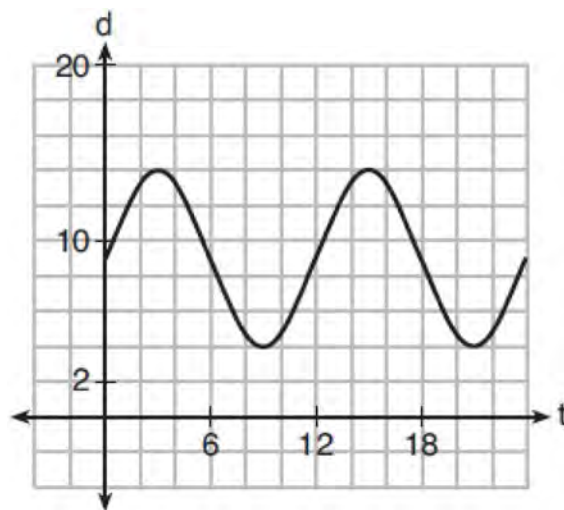


If the depth, $d$, is measured in feet and time, $t$, is measured in hours since midnight, what is an equation for the depth of the water at the marker?
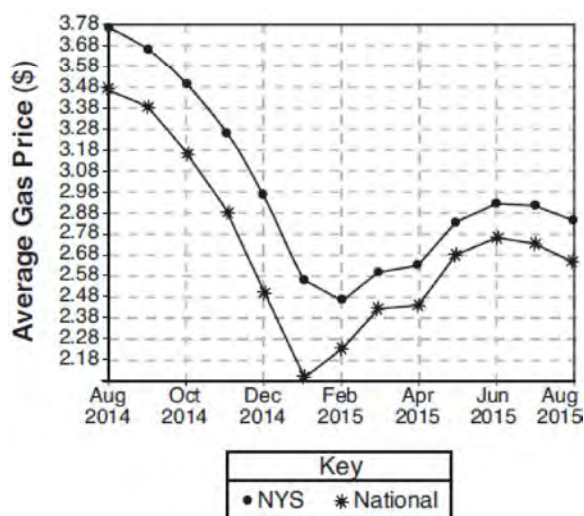
117   The expression $i^2(5x - 2i)^2$ is equivalent to

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

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

120   Which expression is equivalent to $(x - 2)^2 + 27(x - 2) - 90$?

121   The profit function, $p(x)$, is found by subtracting the cost function, $c(x)$, from the revenue function, $r(x)$. Which function below represents the cost function given $p(x) = -15x^2 + 600x + 60$ and $r(x) = -0.4x^2 + 130x + 1200$?

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

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

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

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

126   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?

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

128   What is the value of $y$ for the system shown below?
$$3x + 4y - 5z = -27$$
$$2x + 3y - z = -3$$
$$6x - y + 4z = 3$$

129   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

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

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

132   What is the solution set of the equation
$$\frac{10}{x^2 - 2x} + \frac{4}{x} = \frac{5}{x - 2}?$$

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

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

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

134 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?

135 The crew aboard a small fishing boat caught 350 pounds of fish on Monday. From that Monday through the end of the week on Friday, the weight of the fish caught increased 15% per day. The total weight, in pounds, of fish caught is approximately

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

137 For which equations will the value $s = 4$ make the statement an identity?

     I      $(2x - 3)^2 = 4x^2 - 3sx + 9$

     II     $(x - 2)^3 = (x - 2)(x^2 + sx + s)$

138 What is the value of $x$ in the solution of the system of equations below?

$$5x + 2y - z = -14$$
$$7y - z = 31$$
$$5y + 4z - 5x = -23$$

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

140 A family owned grocery store in New Hartford, NY employs 49 people whose ages are approximately normally distributed with a mean of 36 years and a standard deviation of 6.2 years. Ryan has been hired to work at this store. He is 30 years old. How many people who work at this store would you expect to be younger than Ryan?
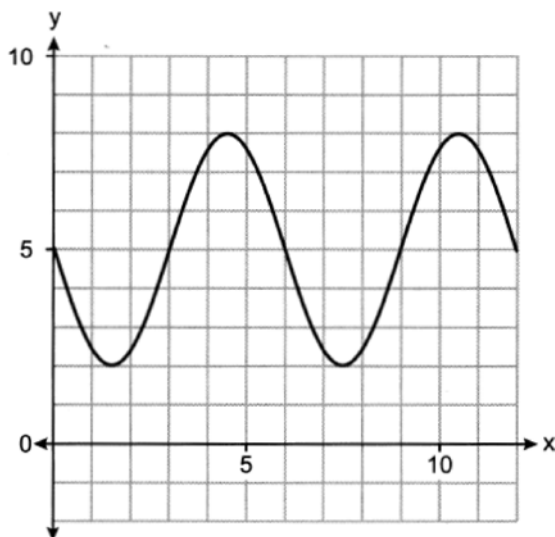
141 The parabola described by the equation $y = \dfrac{1}{12}(x - 2)^2 + 2$ has the directrix at $y = -1$. The focus of the parabola is

142 Which equation is graphed in the diagram below?



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

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

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

$$y = 2x$$

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

146 What is the solution when the equation $wx^2 + w = 0$ is solved for $x$, where $w$ is a positive integer?

147 The volume of a cardboard box can be modeled by $V(x)$, which is the product of the length, width, and height, $x$. If the length can be represented by $L(x) = 18 - 2x$ and the width can be represented by $W(x) = 18 - 2x$, then which function represents $V(x)$?
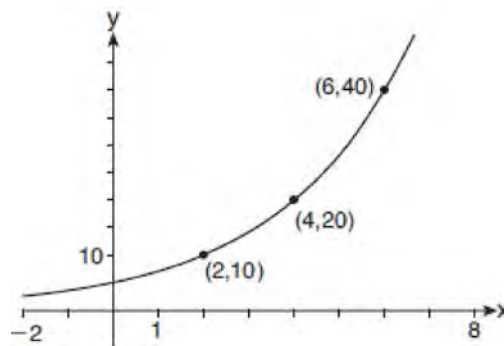
148 Written in simplest form, $\dfrac{c^2 - d^2}{d^2 + cd - 2c^2}$ where $c \neq d$, is equivalent to

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

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

151 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?

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



Which expression defines $f(x)$?

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

154 Perry invested in property that cost him $1500. Five years later it was worth $3000, and 10 years from his original purchase, it was worth $6000. Assuming the growth rate remains the same, which type of function could he create to find the value of his investment 30 years from his original purchase?

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

156 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?

157 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 $I = 100e^{kd}$. What is the approximate value of the constant, $k$?

158 Given $p \neq q, p = \left(\dfrac{1}{2}\right)^q$, expressed in logarithmic form, is equivalent to

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

160 If $4(10^{5x-2}) = 12$ then $x$ equals

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

162 What is the solution set of the following system of equations?
$$y = 3x + 6$$
$$y = (x + 4)^2 - 10$$

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

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

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

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

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

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

## Algebra II Regents Bimodal Worksheets

169  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.
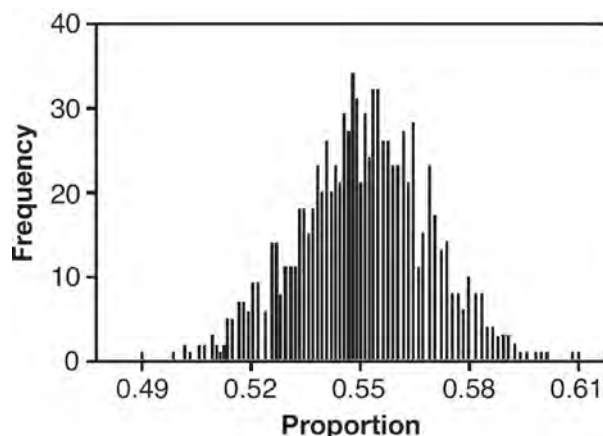


Given this output, and assuming a 95% confidence level, the margin of error for the poll is closest to

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

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

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

173  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

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

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

This function can be best approximated by

175  What are the zeros of
$s(x) = x^4 - 9x^2 + 3x^3 - 27x - 10x^2 + 90?$

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

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

178  Given $f(x) = x^4 - x^3 - 6x^2$, for what values of $x$ will $f(x) > 0$?

179  The zeros for $f(x) = x^4 - 4x^3 - 9x^2 + 36x$ are

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

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

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

181  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 $1.0 \times 10^{-12}$ 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 $6.3 \times 10^{-3}$ W/m$^2$ be classified?

182  The amount of a substance, $A(t)$, that remains after $t$ days can be given by the equation $A(t) = A_0(0.5)^{\frac{t}{0.0803}}$, where $A_0$ represents the initial amount of the substance.  An equivalent form of this equation is

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

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

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

186  What is the solution, if any, of the equation $\dfrac{2}{x+3} - \dfrac{3}{4-x} = \dfrac{2x-2}{x^2-x-12}$?
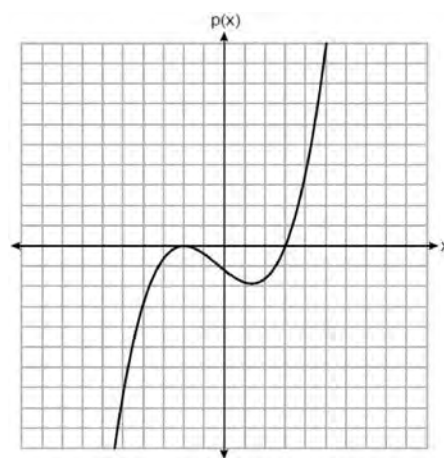
187  Which equation has $1 - i$ as a solution?

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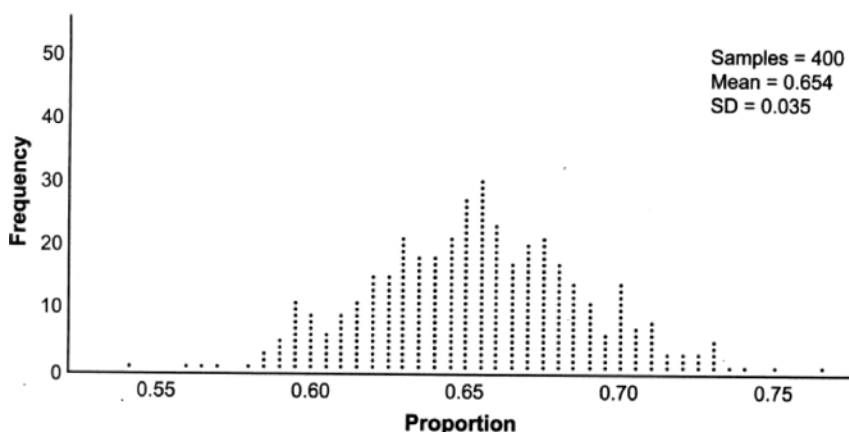


Considering the middle 95% of the data, what is the margin of error for the simulation?

189　A population is normally distributed with a mean of 23 and a standard deviation of 1.2.  The percentage of the population that falls below 21, to the *nearest hundredth*, is

190　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?

191　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

192　The graph of a cubic polynomial function $p(x)$ is shown below.



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

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

194 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?

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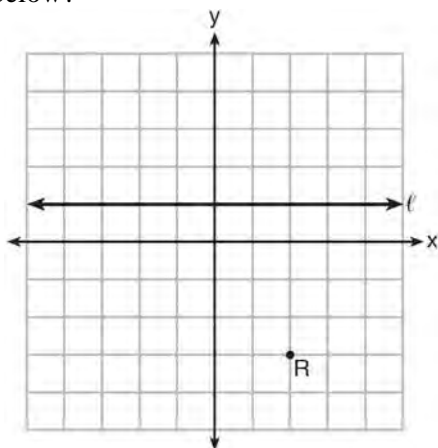


196 What is the solution set of the equation $\dfrac{x+2}{x} + \dfrac{x}{3} = \dfrac{2x^2+6}{3x}$ ?

197 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?

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

199 Which expression is equivalent to $(x+yi)(x^2 - xyi - y^2)$, where $i$ is the imaginary unit?

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

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

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

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

202 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.]

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

204 A parabola has a directrix of $y = 3$ and a vertex at $(2,1)$. Which ordered pair is the focus of the parabola?

205 A cyclist pedals a bike at a rate of 60 revolutions per minute. The height, $h$, of a pedal at time $t$, in seconds, is plotted below.
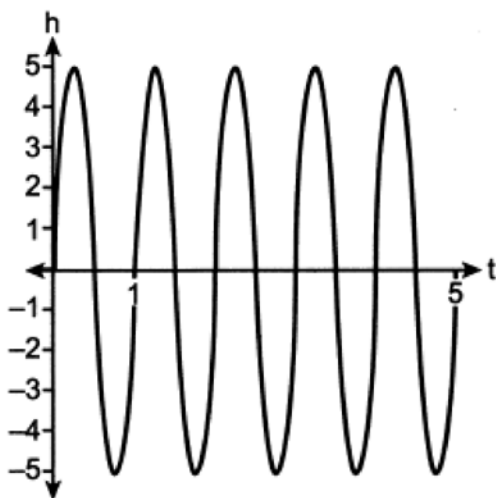


The graph can be modeled by the function $h(t) = 5\sin(kt)$, where $k$ is equal to

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

207 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?

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

209 If $f(x) = 12x - 4$, then the inverse function $f^{-1}(x)$ is

210 Which equation represents a parabola with a focus of $(4,-3)$ and directrix of $y = 1$?

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

212 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.

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

214 Given that $\sin^2\theta + \cos^2\theta = 1$ and $\sin\theta = -\dfrac{\sqrt{2}}{5}$, what is a possible value of $\cos\theta$?

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

216 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

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

218 Given that $i$ is the imaginary unit, the expression $(x-2i)^2$ is equivalent to

219 The inverse of $f(x) = -6x + \dfrac{1}{2}$ is

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

221 For all real values of $x$, if $f(x) = (x-3)^2$ and $g(x) = (x+3)^2$, what is $f(x) - g(x)$?

222 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

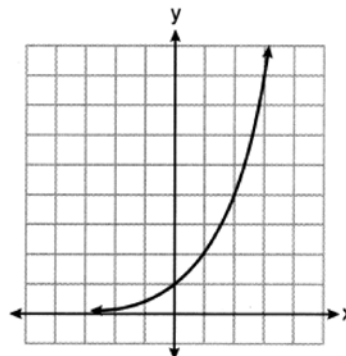$H(t) = 70\sin\left[\dfrac{2\pi}{7}(t-1.75)\right] + 80$, where $t$ is time, in minutes. Using $H(t)$ for one full rotation, this car's minimum height, in feet, is

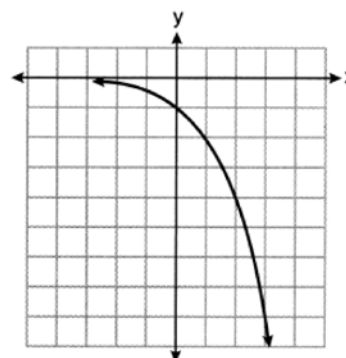223 Which equation is represented by the graph shown below?
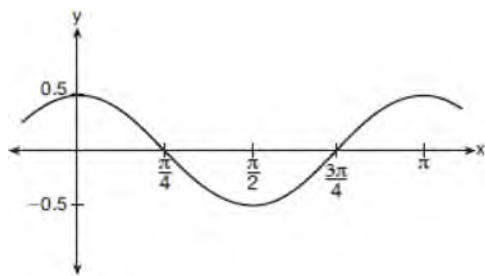


224 A recursive formula for the sequence $18, 9, 4.5, \ldots$ is

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



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



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

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

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

229  Which equation best represents the graph below?

h(x)
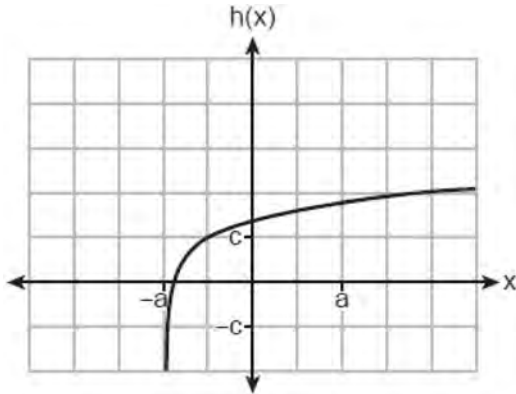


230  A rush-hour commuter train has arrived on time 64 of its first 80 days.  As arrivals continue, which equation can be used to find $x$, the number of consecutive days that the train must arrive on schedule to raise its on-time performance rate to 90%?

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

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

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

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

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

233  When $g(x) = \frac{2}{x+2}$ and $h(x) = \log(x+1) + 3$ are graphed on the same set of axes, which coordinates best approximate their point of intersection?

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

235  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?

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

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

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

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

240  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?

241  In the diagram of a unit circle below, point $A$, $\left( -\dfrac{\sqrt{3}}{2}, \dfrac{1}{2} \right)$, represents the point where the terminal side of $\theta$ intersects the unit circle.
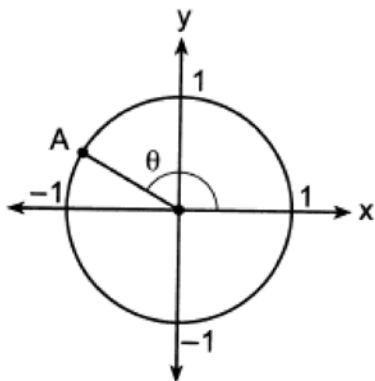


What is $m\angle \theta$?

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

243  According to the USGS, an agency within the Department of Interior of the United States, the frog population in the U.S. is decreasing at the rate of 3.79% per year. A student created a model, $P = 12,150(0.962)^t$, to estimate the population in a pond after $t$ years. The student then created a model that would predict the population after $d$ decades. This model is best represented by

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

245  The expression $\dfrac{4x^3 + 5x + 10}{2x + 3}$ is equivalent to

246  Consider the following patterns:
  I.      $16, -12, 9, -6.75, \ldots$
  II.     $1, 4, 9, 16, \ldots$
  III.    $6, 18, 30, 42, \ldots$
  IV.    $\dfrac{1}{2}, \dfrac{2}{3}, \dfrac{3}{4}, \dfrac{4}{5}, \ldots$

  Which pattern is geometric?

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

248  The graph of a quadratic function is shown below.
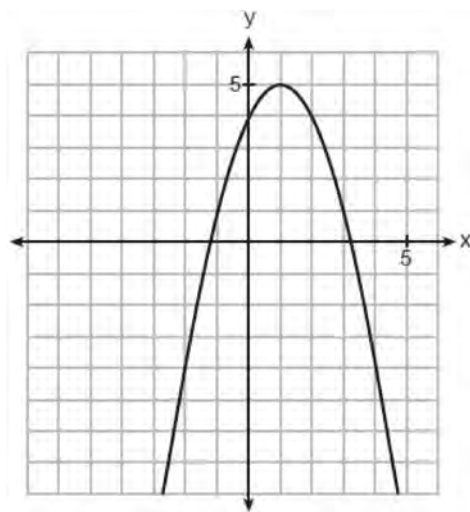


When the graph of $x + y = 4$ is drawn on the same axes, one solution to this system is

249  Written in simplest form, the fraction $\dfrac{x^3 - 9x}{9 - x^2}$, where $x \neq \pm 3$, is equivalent to

250　Consider the data in the table below.

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

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

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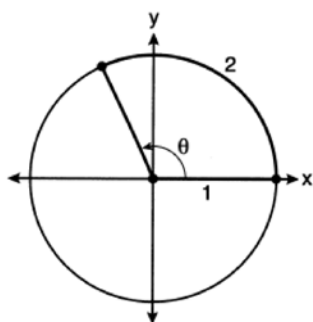


Which value represents the radian measure of angle $\theta$?

252　Which graph has the following characteristics?
  • three real zeros
  • as $x \to -\infty, \ f(x) \to -\infty$
  • as $x \to \infty, \ f(x) \to \infty$

253　A recursive formula for the sequence $64, 48, 36, \ldots$ is

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

255　A recursive formula for the sequence $40, 30, 22.5, \ldots$ is

256　The heights of the 3300 students at Oceanview High School are approximately normally distributed with a mean of 65.5 inches and a standard deviation of 2.9 inches. The number of students at Oceanview who are between 64 and 68 inches tall is closest to

257　The equation below can be used to model the height of a tide in feet, $H(t)$, on a beach at $t$ hours.

$$H(t) = 4.8\sin\left[\frac{\pi}{6}(t+3)\right] + 5.1$$

Using this function, the amplitude of the tide is

258　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?

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

Name: _____

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

261  If $f(t) = 50(.5)^{\frac{t}{5715}}$ represents a mass, in grams, of carbon-14 remaining after $t$ years, which statement(s) must be true?
   I. The mass of the carbon-14 is decreasing by half each year.
   II. The mass of the original sample is 50 g.

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

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

264  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?

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

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

267  What are the zeros of $P(m) = (m^2 - 4)(m^2 + 1)$?

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

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

270  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

271  The average monthly temperature, $T(m)$, in degrees Fahrenheit, over a 12 month period, can be modeled by $T(m) = -23\cos\left(\dfrac{\pi}{6}m\right) + 56$, where $m$ is in months. What is the range of temperatures, in degrees Fahrenheit, of this function?

272  The expression $\dfrac{x^2 + 6}{x^2 + 4}$ is equivalent to

273  What is the solution set of the equation $\dfrac{4}{k^2 - 8k + 12} = \dfrac{k}{k - 2} + \dfrac{1}{k - 6}$?

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

**Favorite Food to Eat While Watching Sports**

|            | Wings | Pizza | Hot Dogs |
|------------|-------|-------|----------|
| **Football** | 14    | 20    | 6        |
| **Baseball** | 6     | 12    | 42       |

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

275   Marissa and Sydney are trying to determine if there is enough interest in their school to put on a senior musical. They randomly surveyed 100 members of the senior class and 43% of them said they would be interested in being in a senior musical.  Marissa and Sydney then conducted a simulation of 500 more surveys, each of 100 seniors, assuming that 43% of the senior class would be interested in being in the musical.  The output of the simulation is shown below.
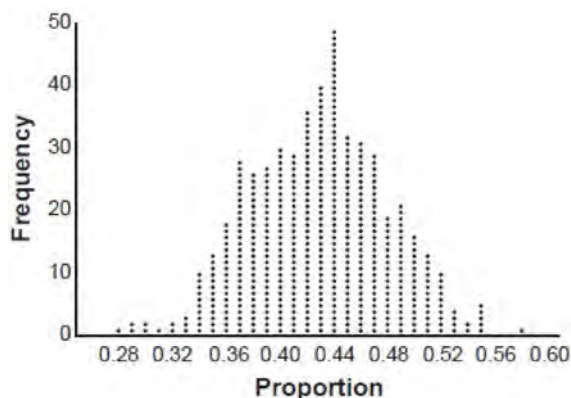


The standard deviation of the simulation is closest to

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

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

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

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

277   What is the inverse of the function $y = \log_3 x$?

278   For which approximate value(s) of $x$ will $\log(x+5) = |x-1| - 3$?

279   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

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

281   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?

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

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

$$x + y + z = 2$$
$$x - 2y - z = -4$$
$$x - 9y + z = -18$$

284 A local university has a current enrollment of 12,000 students. The enrollment is increasing continuously at a rate of 2.5% each year. Which logarithm is equal to the number of years it will take for the population to increase to 15,000 students?

285 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?
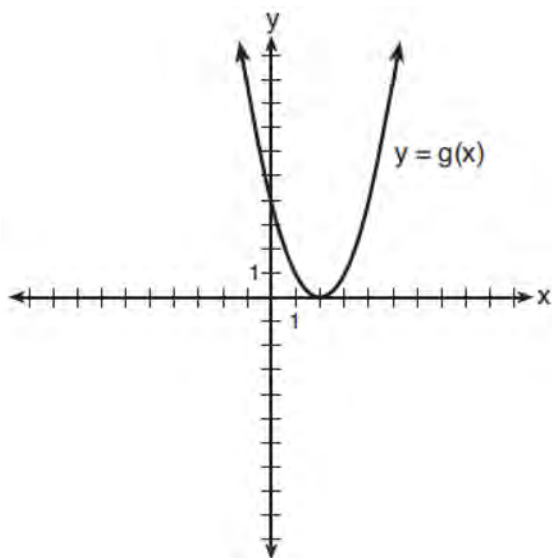


286 If the focus of a parabola is $(0,6)$ and the directrix is $y = 4$, what is an equation for the parabola?

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

I. $\left(\dfrac{y}{x^3}\right)^{-1}$    II. $\sqrt[3]{x^9}\,(y^{-1})$    III. $\dfrac{x^6\sqrt[4]{y^8}}{x^3 y^3}$

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

289 If $f(x) = \dfrac{1}{2}x + 2$, then the inverse function is

290 The heights of the students at Central High School can be modeled by a normal distribution with a mean of 68.1 and a standard deviation of 3.4 inches. According to this model, approximately what percent of the students would have a height less than 60 inches or greater than 75 inches?

291 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?

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

Name: _____

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

294  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?

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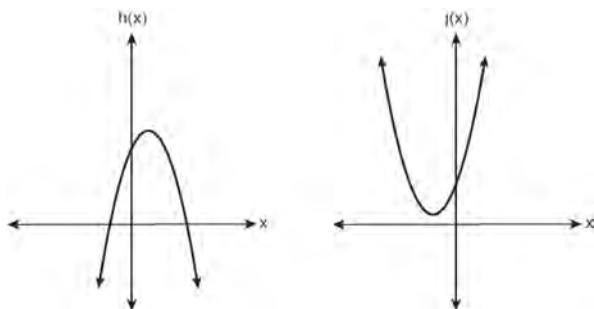


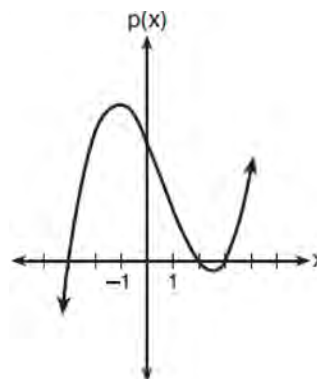Which quadratic functions have imaginary roots?

296  The solution set for the equation
$\sqrt{x+14} - \sqrt{2x+5} = 1$ is

297  When factored completely, $m^5 + m^3 - 6m$ is
equivalent to

298  The roots of the equation $x^2 + 2x + 5 = 0$ are

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

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



Which equation could represent $p(x)$?

301  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?

302  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?

303  Expressed in simplest $a + bi$ form,
$(7 - 3i) + (x - 2i)^2 - (4i + 2x^2)$ is

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

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

306  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?

307  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

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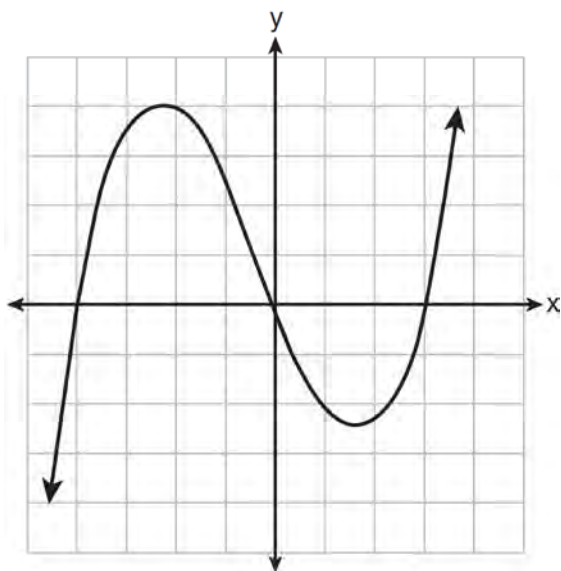


What is the remainder when $p(x)$ is divided by $x + 4$?

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

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

311  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.



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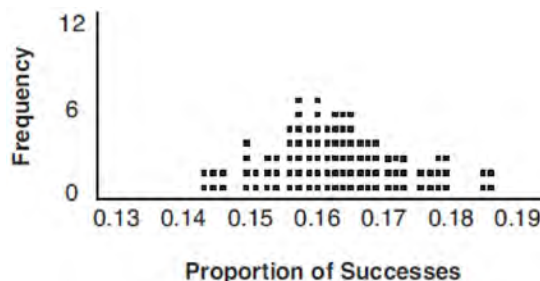
At a 95% confidence level, the proportion of New York City residents with hypertension and the margin of error are closest to

312  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

313  Which expression is equivalent to $\dfrac{x^3 - 2}{x - 2}$?

314  Which expression is equivalent to $(x + 2)^2 - 5(x + 2) + 6$?

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

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

317 Consider the system of equations below?
$$x + 2y - z = 1$$
$$-x - 3y + 2z = 0$$
$$2x - 4y + z = 10$$
What is the solution to the given system of equations?

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

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

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

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

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

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

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

322 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*?

323 Mia has a student loan that is in deferment, meaning that she does not need to make payments right now. The balance of her loan account during her deferment can be represented by the function $f(x) = 35,000(1.0325)^x$, where $x$ is the number of years since the deferment began. If the bank decides to calculate her balance showing a monthly growth rate, an approximately equivalent function would be

324 Which equation represents a parabola with a focus of $(0,4)$ and a directrix of $y = 2$?

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

326 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. $x^{\frac{-1}{6}}$

327 Stone Manufacturing has developed a cost model, $C(x) = 0.18x^3 + 0.02x^2 + 4x + 180$, where $x$ is the number of sprockets sold, in thousands. The sales price can be modeled by $S(x) = 95.4 - 6x$ and the company's revenue by $R(x) = x \bullet S(x)$. The company's profits, $R(x) - C(x)$, could be modeled by

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

329 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*?

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

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

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

333 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.

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

335 The function $f(x) = \dfrac{x - 3}{x^2 + 2x - 8}$ is undefined when $x$ equals

336 In a survey of people who recently bought a laptop, 45% said they were looking for a large screen, 31% said they were looking for a fast processor, and 58% said they wanted a large screen or a fast processor. If a survey respondent is selected at random, what is the probability that the respondent wanted both a large screen and a fast processor?

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

338 Given $f(9) = -2$, which function can be used to generate the sequence $-8, -7.25, -6.5, -5.75, \ldots$?

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

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

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

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

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

342  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?

343  The first term of a geometric sequence is 8 and the fourth term is 216. What is the sum of the first 12 terms of the corresponding series?

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

## Algebra II Regents Bimodal Worksheets
## Answer Section

1 ANS:

$m_1 = 2000$

$m_n = (0.84)m_{n-1}$

PTS: 2          REF: 081909aii          TOP: Sequences          KEY: recursive

2 ANS:

$300.36

$i = \dfrac{6.24\%}{12} = .52\%$  $R = \dfrac{(18000)(.52\%)}{1 - (1 + .52\%)^{-12 \cdot 6}} \approx 300.36$

PTS: 2          REF: 012420aii          TOP: Evaluating Exponential Expressions

3 ANS:

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

PTS: 2          REF: 062411aii          TOP: Modeling Exponential Functions

4 ANS:

$-4x^2 + 3x + 3$

$3x^2 - 7x + 25 - (7x^2 - 10x + 22) = -4x^2 + 3x + 3$

PTS: 2          REF: 012513aii          TOP: Operations with Functions

5 ANS:

$-\dfrac{5}{3}$

$\cos \theta = -\dfrac{3}{5};\ \sec \theta = -\dfrac{5}{3}$

PTS: 2          REF: 012421aii          TOP: Determining Trigonometric Functions

6 ANS:

10.4

PTS: 2          REF: 011804aii          TOP: Graphing Trigonometric Functions

7 ANS:

2
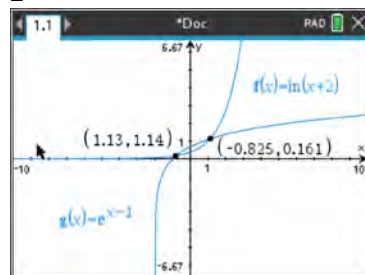


PTS: 2        REF: 081920aii      TOP: Other Systems
KEY: logarithmic

8 ANS:

$-x - 5$

$$\frac{f(x)}{g(x)} = \frac{2x^2 + 7x - 15}{3 - 2x} = \frac{(2x - 3)(x + 5)}{-(2x - 3)} = \frac{x + 5}{-1} = -x - 5$$

PTS: 2        REF: 012412aii      TOP: Operations with Functions

9 ANS:

77

$T(19) = 8\sin(0.3(19) - 3) + 74 \approx 77$

PTS: 2        REF: 061922aii      TOP: Graphing Trigonometric Functions

10 ANS:

$x^3$

$$\frac{x^{\frac{2}{3}} \cdot x^{\frac{5}{2}}}{x^{\frac{1}{6}}} = \frac{x^{\frac{4}{6}} \cdot x^{\frac{15}{6}}}{x^{\frac{1}{6}}} = x^{\frac{18}{6}} = x^3$$

PTS: 2        REF: 081812aii      TOP: Radicals and Rational Exponents

11 ANS:

3.9



PTS: 2        REF: 062402aii      TOP: Other Systems
KEY: rational

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

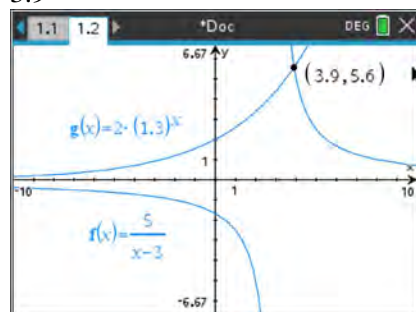PTS: 2          REF: 011819aii     TOP: Remainder and Factor Theorems

13  ANS:
0.25
$P(B) \cdot P(A|B) = P(A \text{ and } B)$

$\quad P(B) \cdot 0.8 = 0.2$

$\qquad P(B) = 0.25$

PTS: 2          REF: 081913aii     TOP: Conditional Probability

14  ANS:
$985,475

$S_{10} = \dfrac{90000 - 90000(1.02)^{10}}{1 - 1.02} \approx 985,475$

PTS: 2          REF: 082424aii     TOP: Series          KEY: geometric

15  ANS:
$y = 5$

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

PTS: 2          REF: 011816aii     TOP: Graphing Quadratic Functions

16  ANS:
$5x^2 + x - 3$

$$
\begin{array}{r}
5x^2 + x - 3 \\
2x - 1 \overline{\smash{)}\, 10x^3 - 3x^2 - 7x + 3} \\
\underline{10x^3 - 5x^2} \\
2x^2 - 7x \\
\underline{2x^2 - x} \\
-6x + 3 \\
\underline{-6x + 3}
\end{array}
$$

PTS: 2          REF: 011809aii     TOP: Rational Expressions
KEY: division

17 ANS:
   I and II, only
   $$x^3 + 2x^2 - 9x - 18 = 0 \quad x^3 - 9x + 2x^2 - 18 = 0 \quad x^3 - 9x + 2x^2 - 18 = 0$$
   $$x^2(x+2) - 9(x+2) = 0 \quad x(x^2-9) + 2(x^2-9) = 0 \quad x(x^2-9) + 2(x^2-9) = 0$$
   $$(x+2)(x^2-9) = 0$$

   PTS: 2          REF: 011903aii     TOP: Solving Polynomial Equations
18 ANS:
   $\pm 2i, 2$
   $$m^3 - 2m^2 + 4m - 8 = 0$$
   $$m^2(m-2) + 4(m-2) = 0$$
   $$\left(m^2 + 4\right)(m-2) = 0$$

   PTS: 2          REF: 081821aii     TOP: Solving Polynomial Equations
19 ANS:
   293.609
   $$S_{15} = \frac{10 - 10(1.09)^{15}}{1 - 1.09} \approx 293.609$$

   PTS: 2          REF: 062424aii     TOP: Series          KEY: geometric
20 ANS:
   $400(1.001121184)^{52t}$
   $1.06^{\frac{1}{52}}$

   PTS: 2          REF: 061924aii     TOP: Modeling Exponential Functions
21 ANS:
   45
   $$P = \frac{2\pi}{\frac{\pi}{45}} = 90$$

   PTS: 2          REF: 081822aii     TOP: Graphing Trigonometric Functions
   KEY: period

22 ANS:
3.7
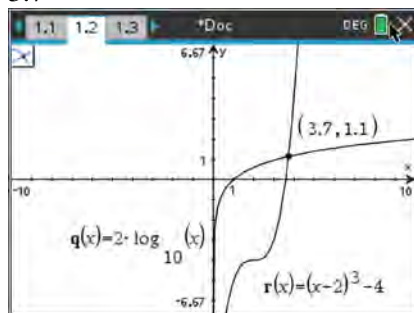


PTS: 2    REF: 082417aii    TOP: Other Systems
KEY: logarithmic

23 ANS:
(3,0)

$\log_2(x-1) - 1 = 0$

$\log_2(x-1) = 1$

$x - 1 = 2^1$

$x = 3$

PTS: 2    REF: 061819aii    TOP: Graphing Logarithmic Functions

24 ANS:
$(-5,0)$

In vertex form, the parabola is $y = \dfrac{1}{4(2)}(x+5)^2 - 2$. The vertex is $(-5,-2)$ and $p = 2$. $2 + -2 = 0$

PTS: 2    REF: 082416aii    TOP: Graphing Quadratic Functions

25 ANS:
8.52

PTS: 2    REF: 061914aii    TOP: Other Systems
KEY: table

26 ANS:
$\dfrac{124}{x + 16y}$

PTS: 2    REF: 061824aii    TOP: Modeling Rationals

27 ANS:
10.25

The maximum of $p$ is 5. The minimum of $f$ is $-\frac{21}{4}$ $(x = \frac{-6}{2(4)} = -\frac{3}{4}$

$f\left(-\frac{3}{4}\right) = 4\left(-\frac{3}{4}\right)^2 + 6\left(-\frac{3}{4}\right) - 3 = 4\left(\frac{9}{16}\right) - \frac{18}{4} - \frac{12}{4} = -\frac{21}{4}).$ $\frac{20}{4} - \left(-\frac{21}{4}\right) = \frac{41}{4} = 10.25$

PTS: 2        REF: 011922aii        TOP: Comparing Functions

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

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

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

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

PTS: 2        REF: 061821aii        TOP: Graphing Quadratic Functions

29 ANS:
$a_1 = 25,000$, $a_n = a_{n-1} + 1000$

PTS: 2        REF: 011824aii        TOP: Sequences        KEY: recursive

30 ANS:
$713,476.20

$S_7 = \frac{85000 - 85000(1.06)^7}{1 - 1.06} \approx 713476.20$

PTS: 2        REF: 061905aii        TOP: Series        KEY: geometric

31 ANS:
18

$120 = 68 + (195 - 68)e^{-0.05t}$

$52 = 127e^{-0.05t}$

$\ln\frac{52}{127} = \ln e^{-0.05t}$

$\ln\frac{52}{127} = -0.05t$

$\frac{\ln\frac{52}{127}}{-0.05} = t$

$18 \approx t$

PTS: 2        REF: 081918aii        TOP: Exponential Decay

32  ANS:
7
$$1240(1.06)^x = 890(1.11)^x$$
$$x \approx 7$$

PTS:  2          REF:  061814aii     TOP:  Other Systems
KEY:  exponential

33  ANS:
$$y = \frac{1}{4}(x+3)^2 + 1$$

Distance from the focus to the directrix is 2, so $p = 1$.  Vertex is $(-3,1)$.  $y = \frac{1}{4(1)}(x+3)^2 + 1$

PTS:  2          REF:  012409aii     TOP:  Graphing Quadratic Functions

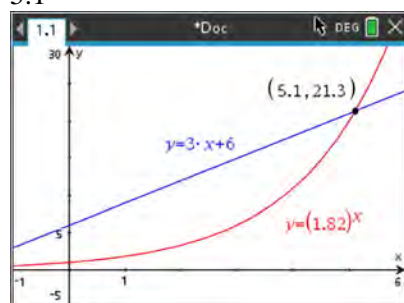34  ANS:
0.8

PTS:  2          REF:  081824aii     TOP:  Conditional Probability

35  ANS:
5.1



PTS:  2          REF:  012406aii     TOP:  Other Systems
KEY:  exponential

36  ANS:
{6}
$$x + 1 = \sqrt{4x+25} \quad -4 + 1 < 0$$
$$x^2 + 2x + 1 = 4x + 25$$
$$x^2 - 2x - 24 = 0$$
$$(x-6)(x+4) = 0$$
$$x = 6, -4$$

PTS:  2          REF:  062408aii     TOP:  Solving Radicals

37  ANS:

$$\frac{1}{5} \pm \frac{\sqrt{19}}{5} i$$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(5)(4)}}{2(5)} = \frac{2 \pm \sqrt{-76}}{10} = \frac{2 \pm i\sqrt{4}\sqrt{19}}{10} = \frac{1}{5} \pm \frac{i\sqrt{19}}{5}$$

PTS: 2　　　　　REF: 011905aii　　　TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

38  ANS:

$$-\frac{24}{7}$$

If $\cos \theta = \frac{7}{25}$, $\sin \theta = \pm\frac{24}{25}$, and $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{-\frac{24}{25}}{\frac{7}{25}} = -\frac{24}{7}$

PTS: 2　　　　　REF: 081811aii　　　TOP: Determining Trigonometric Functions

39  ANS:
$2.02 to $2.22 for a gallon of gas
$2.12 \pm 2(.05)$

PTS: 2　　　　　REF: 012509aii　　　TOP: Normal Distributions

40  ANS:

$$2x^3 - 4x^2 - x + \frac{14}{x+6}$$

$$x+6 \overline{\smash{\big)}\ 2x^4 + 8x^3 - 25x^2 - 6x + 14}$$
$$\underline{2x^4 + 12x^3}$$
$$-4x^3 - 25x^2$$
$$\underline{-4x^3 - 24x^2}$$
$$-x^2 - 6x$$
$$\underline{-x^2 - 6x}$$

with quotient $2x^3 - 4x^2 - x + \frac{14}{x+6}$

PTS: 2　　　　　REF: 081805aii　　　TOP: Rational Expressions
KEY: division

41  ANS:
380
$400 \cdot .954 \approx 380$

PTS: 2　　　　　REF: 061918aii　　　TOP: Normal Distributions
KEY: predict

42 ANS:
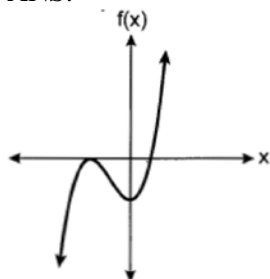


PTS: 2 REF: 012405aii TOP: Graphing Polynomial Functions

43 ANS:

$a = 2, b = 6, c = 3$

The cosine function has been translated +3. Since the maximum is 5 and the minimum is 1, the amplitude is 2.

$\dfrac{\pi}{3} = \dfrac{2\pi}{b}.$

$b = 6$

PTS: 2 REF: 011913aii TOP: Modeling Trigonometric Functions

44 ANS:

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

$A(t) = 150\left((1.02)^{\frac{1}{7}}\right)^{7t} \approx 150(1.00283)^{7t}$

PTS: 2 REF: 062415aii TOP: Modeling Exponential Functions

45 ANS:

$\dfrac{x+3}{x}$

$\dfrac{x^2(x+2) - 9(x+2)}{x\left(x^2 - x - 6\right)} = \dfrac{\left(x^2 - 9\right)(x+2)}{x(x-3)(x+2)} = \dfrac{(x+3)(x-3)}{x(x-3)} = \dfrac{x+3}{x}$

PTS: 2 REF: 061803aii TOP: Rational Expressions
KEY: factoring

46 ANS:

$$3x - 1 - \frac{1}{3x+1}$$

$$\begin{array}{r} 3x - 1 \\ 3x+1 \overline{)9x^2 + 0x - 2} \\ \underline{9x^2 + 3x} \\ -3x - 2 \\ \underline{-3x - 1} \\ -1 \end{array}$$

PTS: 2    REF: 081910aii    TOP: Rational Expressions
KEY: division

47 ANS:

$$-3x^2 + 18xi$$

$$(x + 3i)^2 - (2x - 3i)^2 = x^2 + 6xi + 9i^2 - \left(4x^2 - 12xi + 9i^2\right) = -3x^2 + 18xi$$

PTS: 2    REF: 061805aii    TOP: Operations with Complex Numbers

48 ANS:

$$\frac{85}{295}$$

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

PTS: 2    REF: 081818aii    TOP: Conditional Probability

49 ANS:

$$2x^3 + 6x^2 + 13x + 42 + \frac{124}{x-3}$$

$$x-3 \overline{\smash{\big)}\, \begin{array}{c} 2x^3 + 6x^2 + 13x + 42 \\ 2x^4 + 0x^3 - 5x^2 + 3x - 2 \end{array}}$$

$$\underline{2x^4 - 6x^3}$$

$$6x^3 - 5x^2$$

$$\underline{6x^3 - 18x^2}$$

$$13x^2 + 3x$$

$$\underline{13x^2 - 39x}$$

$$42x - 2$$

$$\underline{42x - 126}$$

$$124$$

PTS: 2 REF: 012408aii TOP: Rational Expressions
KEY: division

50 ANS:

$$8\sqrt{6}$$

$$r = \frac{-2\sqrt{3}}{\sqrt{6}} = \frac{-2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{-2\sqrt{2}}{2} = -\sqrt{2} \quad a_7 = \sqrt{6}(-\sqrt{2})^{7-1} = \sqrt{6}(-\sqrt{2})^6 = \sqrt{6} \cdot 2^3 = 8\sqrt{6}$$

PTS: 2 REF: 012410aii TOP: Sequences KEY: explicit

51 ANS:
$$x = -4$$

PTS: 2 REF: 082409aii TOP: Graphing Logarithmic Functions

52 ANS:
$$-3$$

PTS: 2 REF: 011815aii TOP: Unit Circle

53  ANS:
$\{5,7\}$

$$x^2 - 4x - 5 = 4x^2 - 40x + 100$$

$$3x^2 - 36x + 105 = 0$$

$$x^2 - 12x + 35 = 0$$

$$(x - 7)(x - 5) = 0$$

$$x = 5,7$$

PTS: 2          REF: 081807aii     TOP: Solving Radicals
KEY: extraneous solutions

54  ANS:
$-19 - 17i$
$$-3 + 5i - \left(4 + 24i - 2i - 12i^2\right) = -3 + 5i - (16 + 22i) = -19 - 17i$$

PTS: 2          REF: 081815aii     TOP: Operations with Complex Numbers

55  ANS:
$-4 - 8xi$
$$(2x - i)^2 - (2x - i)(2x + 3i)$$

$$(2x - i)[(2x - i) - (2x + 3i)]$$

$$(2x - i)(-4i)$$

$$-8xi + 4i^2$$

$$-8xi - 4$$

PTS: 2          REF: 011911aii     TOP: Operations with Complex Numbers

56  ANS:
$$y = \frac{1}{4}x - \frac{5}{4}$$
$$x = 4y + 5$$
$$x - 5 = 4y$$
$$\frac{1}{4}x - \frac{5}{4} = y$$

PTS: 2          REF: 061909aii     TOP: Inverse of Functions
KEY: linear

57 ANS:

$$\dfrac{\ln\left(\dfrac{c}{a}\right)}{b}$$

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

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

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

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

PTS: 2        REF: 011813aii      TOP: Exponential Equations
KEY: without common base

58 ANS:
I, II, and III

$$\dfrac{x^2 - 4x}{2x} = \dfrac{x(x - 4)}{2x} = \dfrac{x - 4}{2} \qquad \dfrac{x}{2} - 2 \qquad \dfrac{x - 1}{2} - \dfrac{3}{2} = \dfrac{x - 1 - 3}{2} = \dfrac{x - 4}{2}$$

PTS: 2        REF: 011921aii      TOP: Rational Expressions
KEY: factoring

59 ANS:
neither I nor II
$$(x - y)^2 = x^2 - 2xy + y^2 \quad (x + y)^3 = x^3 + 3x^2 y + 3xy^2 + y^3$$

PTS: 2        REF: 061902aii      TOP: Polynomial Identities

60 ANS:
$$(x - 4)^3$$

$$y = \sqrt[3]{x} + 4$$

$$x = \sqrt[3]{y} + 4$$

$$x - 4 = \sqrt[3]{y}$$

$$(x - 4)^3 = y$$

PTS: 2        REF: 012519aii      TOP: Inverse of Functions
KEY: cubic

61 ANS:
$g(x) = 2x - 16$

$y = \dfrac{1}{2}x + 8 \quad x = \dfrac{1}{2}y + 8$

$\qquad\qquad 2x = y + 16$

$\qquad\qquad y = 2x - 16$

PTS: 2　　　　　REF: 081806aii　　TOP: Inverse of Functions
KEY: linear

62 ANS:
$a_0 = 75{,}000$

$a_n = 0.92(a_{n-1})$

PTS: 2　　　　　REF: 081810aii　　TOP: Sequences　　KEY: recursive

63 ANS:
$-15 + 7xi$

$5i(2x + 3i) - x\sqrt{-9} = 10xi + 15i^2 - 3xi = -15 + 7xi$

PTS: 2　　　　　REF: 082415aii　　TOP: Operations with Complex Numbers

64 ANS:
$\{-1, 0\}$

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

$\quad x + 1 = x^2 + 2x + 1$

$\qquad 0 = x^2 + x$

$\qquad 0 = x(x + 1)$

$\qquad x = -1, 0$

PTS: 2　　　　　REF: 011802aii　　TOP: Solving Radicals
KEY: extraneous solutions

65 ANS:
$(n + 3)(n - 3)(n + 6)(n - 2)$

$n^2\left(n^2 - 9\right) + 4n\left(n^2 - 9\right) - 12\left(n^2 - 9\right)$

$\quad\left(n^2 + 4n - 12\right)\left(n^2 - 9\right)$

$\quad (n + 6)(n - 2)(n + 3)(n - 3)$

PTS: 2　　　　　REF: 061911aii　　TOP: Factoring Polynomials
KEY: factoring by grouping

66  ANS:
$(7.02, 12.62)$
$9.82 \pm 2(1.4)$

PTS: 2                    REF: 012411aii        TOP: Analysis of Data
KEY: draw conclusions

67  ANS:
$6166.50
$$5000\left(1 + \frac{.035}{12}\right)^{12 \cdot 6} \approx 6166.50$$

PTS: 2                    REF: 081917aii        TOP: Modeling Exponential Functions

68  ANS:
$\pm 3i, -4, 3$

$3 \mid 1\ 1 - 3\quad 9 - 108 \qquad x^3 + 4x^2 + 9x + 36 = 0$

$\underline{\mid\ \ 3\ \ 12\ \ 27\quad 108}\quad x^2(x + 4) + 9(x + 4) = 0$

$\quad 1\ 4\ \ 9\ \ 36 \qquad 0 \qquad (x^2 + 9)(x + 4) = 0$

$$x = \pm 3i, -4$$

PTS: 2                    REF: 062420aii        TOP: Solving Polynomial Equations

69  ANS:
II and III

I. Minimum does not change, only period;  II. $-16 + 8 = -8$;  III. $\frac{1}{2}(-16) = -8$

PTS: 2                    REF: 012523aii        TOP: Transformations with Functions

70  ANS:
$x^3 - 2$
$y = \sqrt[3]{x + 2}$
$x = \sqrt[3]{y + 2}$
$x^3 = y + 2$
$y = x^3 - 2$

PTS: 2                    REF: 062419aii        TOP: Inverse of Functions
KEY: cubic

71  ANS:
5.62

PTS: 2                    REF: 081819aii        TOP: Other Systems
KEY: logarithmic

72 ANS:

−2

$f(x) = (x + 1)(x − 1)(x − 2) = (x^2 − 1)(x − 2) = x^3 − 2x^2 − x + 2$

PTS: 2　　　　REF: 081921aii　　TOP: Solving Polynomial Equations

73 ANS:

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

PTS: 2　　　　REF: 011917aii　　TOP: Inverse of Functions
KEY: exponential

74 ANS:

$6x^3 − 8x^2 + 16x − 31 + \dfrac{262}{x + 2}$

$$
\begin{array}{r}
6x^3 − 8x^2 + 16x − 31 \\
x + 2 \overline{)\, 6x^4 + 4x^3 + 0x^2 + x + 200} \\
\underline{6x^4 + 12x^3} \\
− 8x^3 + 0x^2 \\
\underline{− 8x^3 − 16x^2} \\
16x^2 + x \\
\underline{16x^2 + 32x} \\
− 31x + 200 \\
\underline{−31x − 62} \\
262
\end{array}
$$

PTS: 2　　　　REF: 082407aii　　TOP: Rational Expressions
KEY: division

75 ANS:

99.1



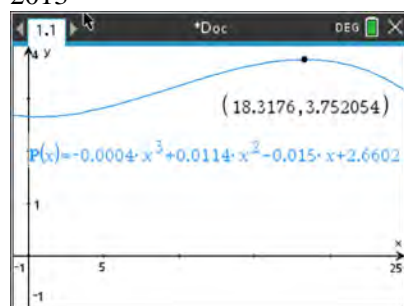$\overline{x} + 2\sigma$ represents approximately 99.1% of the data.

PTS: 2　　　　REF: 012514aii　　TOP: Normal Distributions
KEY: percent

76 ANS:
2013



PTS: 2 REF: 012414aii TOP: Graphing Polynomial Functions

77 ANS:
$H(t) = 50(1.015)^{12t}$

$50(1.19^{\frac{1}{12}})^{12t} \approx 50(1.015)^{12t}$

PTS: 2 REF: 012424aii TOP: Modeling Exponential Functions

78 ANS:
12%
$0.48 \cdot 0.25 = 0.12$

PTS: 1 REF: 061811aii TOP: Probability of Compound Events

79 ANS:
The probability of being late given that a student walked is greater than the probability that a student walked given that the student was late.

The probability of being late given that a student walked is $\frac{4}{22}$. The probability that student walked given that the student was late is $\frac{4}{30}$.

PTS: 2 REF: 012518aii TOP: Conditional Probability

80 ANS:
$r(x) = (x - a)(x + b)(x + c)^2$

PTS: 2 REF: 061921aii TOP: Graphing Polynomial Functions

81 ANS:
$f(t) = 10,000(1.00075)^{12t} + 10,000e^{0.008t}$

$1 + \frac{.009}{12} = 1.00075$

PTS: 2 REF: 011918aii TOP: Modeling Exponential Functions

82  ANS:

$2x^2 + 3x + 4$

$$x - 3 \overline{\smash{\big)}\ 2x^3 - 3x^2 - 5x - 12} \atop \phantom{x-3)}\ \ \ \ \ \ \ 2x^2 + 3x + 4$$

$$\underline{2x^3 - 6x^2}$$

$$3x^2 - 5x$$

$$\underline{3x^2 - 9x}$$

$$4x - 12$$

$$\underline{4x - 12}$$

$$0$$

PTS:  2          REF:  012505aii      TOP:  Rational Expressions
KEY:  division

83  ANS:

$17,433,922.00

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

PTS:  2          REF:  011822aii      TOP:  Series          KEY:  geometric

84  ANS:

$(-3, -15)$

$$x^2 - 24 = x - 12 \quad y = -3 - 12 = -15$$

$$x^2 - x - 12 = 0$$

$$(x - 4)(x + 3) = 0$$

$$x = 4, -3$$

PTS:  2          REF:  062404aii      TOP:  Quadratic-Linear Systems

85  ANS:

$$y = -\frac{1}{8}(x + 3)^2 + 5$$

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

PTS:  2          REF:  011914aii      TOP:  Graphing Quadratic Functions

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

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

$\qquad x = 6 \qquad z = 4$

PTS:  2 REF:  011803aii TOP:  Solving Linear Systems
KEY:  three variables

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

$y = x^3 - 2$

$x = y^3 - 2$

$x + 2 = y^3$

$\sqrt[3]{x + 2} = y$

PTS:  2 REF:  061815aii TOP:  Inverse of Functions
KEY:  cubic

88  ANS:
631
$84.1\% \times 750 \approx 631$

PTS:  2 REF:  011923aii TOP:  Normal Distributions
KEY:  predict

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

$\qquad k = 3$

PTS:  2 REF:  061812aii TOP:  Remainder and Factor Theorems

90  ANS:
$6\sqrt[3]{x^5}$

$4x \bullet x^{\frac{2}{3}} + 2x^{\frac{5}{3}} = 4x^{\frac{5}{3}} + 2x^{\frac{5}{3}} = 6x^{\frac{5}{3}} = 6\sqrt[3]{x^5}$

PTS:  2 REF:  061820aii TOP:  Radicals and Rational Exponents

91 ANS:
7

$$\frac{x(x-4)}{(x+3)(x-4)} + \frac{2(x+3)}{(x-4)(x+3)} = \frac{2x+27}{(x-4)(x+3)} \quad -3 \text{ is extraneous.}$$

$$x^2 - 4x + 2x + 6 = 2x + 27$$

$$x^2 - 2x + 6 = 2x + 27$$

$$x^2 - 4x - 21 = 0$$

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

$$x = 7, -3$$

PTS: 2        REF: 082405aii        TOP: Solving Rationals

92 ANS:
$x = 0.75$ or $x = -2$

$$2x\left(2x + \frac{5}{2} = \frac{3}{x}\right)$$

$$4x^2 + 5x = 6$$

$$4x^2 + 5x - 6 = 0$$

$$(4x-3)(x+2) = 0$$

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

PTS: 2        REF: 012504aii        TOP: Other Systems
KEY: rational

93 ANS:

$$A = 300\left[(1.00225)^{12}\right]^{t}$$

$$1 + \frac{0.027}{12} = 1.00225$$

PTS: 2        REF: 082403aii        TOP: Modeling Exponential Functions

94 ANS:

$\left\{ \dfrac{1}{2} \right\}$

$\dfrac{2}{3x+1} = \dfrac{1}{x} - \dfrac{6x}{3x+1}$   $-\dfrac{1}{3}$ is extraneous.

$\dfrac{6x+2}{3x+1} = \dfrac{1}{x}$

$6x^2 + 2x = 3x + 1$

$6x^2 - x - 1 = 0$

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

$x = \dfrac{1}{2}, -\dfrac{1}{3}$

PTS: 2       REF: 011915aii       TOP: Solving Rationals

95 ANS:

$f^{-1}(x) = 2 - \dfrac{x}{6}$

$x = -6(y - 2)$

$-\dfrac{x}{6} = y - 2$

$-\dfrac{x}{6} + 2 = y$

PTS: 2       REF: 011821aii       TOP: Inverse of Functions
KEY: linear

96 ANS:

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

$x - \dfrac{4}{x-1} = 2$       $x = \dfrac{3 \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)} = \dfrac{3 \pm \sqrt{17}}{2}$

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

$x^2 - x - 4 = 2x - 2$

$x^2 - 3x - 2 = 0$

PTS: 2       REF: 011812aii       TOP: Solving Rationals
KEY: rational solutions

97  ANS:
   2%

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

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

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

$$r \approx .02$$

   PTS: 2          REF: 011810aii     TOP: Exponential Growth

98  ANS:

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

   1 year = 365 days

   PTS: 2          REF: 061823aii     TOP: Modeling Exponential Functions

99  ANS:
   $g(x) = \log_3(x+5)$

   PTS: 2          REF: 011902aii     TOP: Graphing Logarithmic Functions

100  ANS:
   140

$$F = 325 - 185e^{-0.4(0)} = 325 - 185 = 140$$

   PTS: 2          REF: 012415aii     TOP: Evaluating Exponential Expressions

101  ANS:
   72%
   $P(B) \cdot P(P|B) = P(P \text{ and } B)$

$$.68 \cdot P(P|B) = .49$$

$$P(P|B) = .72$$

   PTS: 2          REF: 062416aii     TOP: Conditional Probability

102  ANS:
   0.271

$$y = 278(0.5)^{\frac{18}{1.8}} \approx 0.271$$

   PTS: 2          REF: 011920aii     TOP: Modeling Exponential Functions

103 ANS:
168

$y = 40(1.2)^8 \approx 168$

PTS: 2    REF: 062406aii    TOP: Regression    KEY: exponential

104 ANS:

$\dfrac{\pi}{6}$

$\dfrac{2\pi}{b} = 12$

$12b = 2\pi$

$b = \dfrac{\pi}{6}$

PTS: 2    REF: 012520aii    TOP: Graphing Trigonometric Functions
KEY: period

105 ANS:
II and III

$3|-2 - 11 - 12 \quad 9$  $x - 3$ is not a factor since there is a remainder.  $-2|-2 - 11 - 12 \quad 9$

$\underline{|\quad\quad -6 - 51 - 189}$     $\underline{|\quad\quad\quad 4 \quad 14 - 4}$

$-2 - 17 - 63 - 180$      $-2 \quad -7 \quad\quad 2 \quad 5$

PTS: 2    REF: 062414aii    TOP: Remainder and Factor Theorems

106 ANS:
10 or −2

$x - \dfrac{20}{x} = 8$

$x^2 - 8x - 20 = 0$

$(x - 10)(x + 2) = 0$

$x = 10, -2$

PTS: 2    REF: 061916aii    TOP: Modeling Rationals

107 ANS:

$$\frac{\ln 6}{\ln 2} - 4$$

$$6\left(2^{x+4}\right) = 36$$

$$\ln 2^{x+4} = \ln 6$$

$$(x+4)\ln 2 = \ln 6$$

$$x + 4 = \frac{\ln 6}{\ln 2}$$

$$x = \frac{\ln 6}{\ln 2} - 4$$

PTS: 2    REF: 082408aii    TOP: Exponential Equations
KEY: without common base

108 ANS:
10
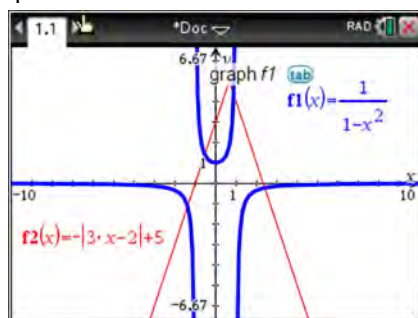$440 \times 2.3\% \approx 10$

PTS: 2    REF: 011807aii    TOP: Normal Distributions
KEY: predict

109 ANS:
4



PTS: 2    REF: 011924aii    TOP: Other Systems
KEY: rational

110 ANS:

$$1 \pm \frac{\sqrt{6}}{3} i$$

$$3x^2 - 4x + 2 = 2x - 3 \quad x = \frac{6 \pm \sqrt{(-6)^2 - 4(3)(5)}}{2(3)} = \frac{6 \pm \sqrt{-24}}{6} = \frac{6 \pm 2i\sqrt{6}}{6} = 1 \pm \frac{i\sqrt{6}}{3}$$
$$3x^2 - 6x + 5 = 0$$

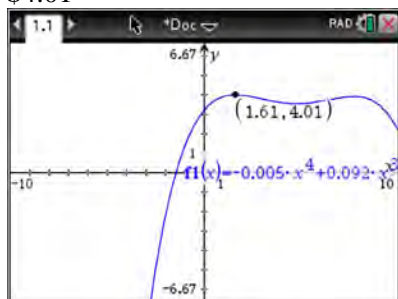PTS: 2    REF: 062410aii    TOP: Solving Quadratics

111  ANS:
$(0.134, 0.374)$
$0.254 \pm 2(0.060) \rightarrow (0.134, 0.374)$

PTS: 2            REF: 061913aii        TOP: Analysis of Data

112  ANS:
$y = 2000(1.0032737)^{12t}$

$1.04^{\frac{1}{12}} \approx 1.0032737$

PTS: 2            REF: 011906aii        TOP: Modeling Exponential Functions

113  ANS:
$4.01



PTS: 2            REF: 011817aii        TOP: Graphing Polynomial Functions

114  ANS:
$-\dfrac{1}{3} \pm \dfrac{2i\sqrt{5}}{3}$

$x = \dfrac{-2 \pm \sqrt{2^2 - 4(3)(7)}}{2(3)} = \dfrac{-2 \pm \sqrt{-80}}{6} = \dfrac{-2 \pm i\sqrt{16}\sqrt{5}}{6} = -\dfrac{1}{3} \pm \dfrac{2i\sqrt{5}}{3}$

PTS: 2            REF: 081809aii        TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

115  ANS:
$-\dfrac{\sqrt{7}}{4}$

$-\sqrt{1 - \left(-\dfrac{3}{4}\right)^2} = -\sqrt{\dfrac{16}{16} - \dfrac{9}{16}} = -\sqrt{\dfrac{7}{16}} = -\dfrac{\sqrt{7}}{4}$

PTS: 2            REF: 081905aii        TOP: Determining Trigonometric Functions

116 ANS:

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

$$a = \frac{14 - 4}{2} = 5, d = \frac{14 + 4}{2} = 9$$

PTS: 2          REF: 061810aii          TOP: Modeling Trigonometric Functions

117 ANS:

$$-25x^2 + 20xi + 4$$

$$i^2(5x - 2i)^2 = -(25x^2 - 20xi - 4)$$

PTS: 2          REF: 012512aii          TOP: Operations with Complex Numbers

118 ANS:

$$-1$$

$$y = x^3 - 3$$

$$x = y^3 - 3$$

$$x + 3 = y^3$$

$$\sqrt[3]{x + 3} = y$$

PTS: 2          REF: 012419aii          TOP: Inverse of Functions

KEY: cubic

119 ANS:

29

$$p(2) = 4(2)^3 - 3(2) + 3 = 29$$

PTS: 2          REF: 062422aii          TOP: Remainder and Factor Theorems

120 ANS:

$$(x + 28)(x - 5)$$

$$u = x - 2 \qquad u^2 + 27u - 90$$

$$(u + 30)(u - 3)$$

$$(x - 2 + 30)(x - 2 - 3)$$

$$(x + 28)(x - 5)$$

PTS: 2          REF: 012503aii          TOP: Factoring Polynomials

121 ANS:

$$c(x) = 14.6x^2 - 470x + 1140$$

$$p(x) = r(x) - c(x)$$

$$-15x^2 + 600x + 60 = -0.4x^2 + 130x + 1200 - c(x)$$

$$c(x) = 14.6x^2 - 470x + 1140$$

PTS: 2          REF: 062421aii          TOP: Operations with Functions

122 ANS:

$-\dfrac{7}{24}$

If $\sin\theta = \dfrac{7}{25}$, $\cos\theta = -\dfrac{24}{25}$ in QII, and $\tan\theta = \dfrac{\sin\theta}{\cos\theta} = \dfrac{\dfrac{7}{25}}{\dfrac{-24}{25}} = -\dfrac{7}{24}$
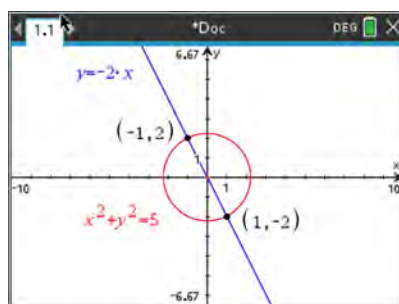
PTS: 2    REF: 062417aii    TOP: Determining Trigonometric Functions

123 ANS:

$(-1, 2)$



$x^2 + (-2x)^2 = 5 \quad y = -2(-1) = 2$

$5x^2 = 5$

$x^2 = 1$

$x = \pm 1$

PTS: 2    REF: 012407aii    TOP: Quadratic-Linear Systems

124 ANS:

$(x+5)(x+3)$

$u = x + 2 \quad u^2 + 4u + 3$

$(u+3)(u+1)$

$(x+2+3)(x+2+1)$

$(x+5)(x+3)$

PTS: 2    REF: 081901aii    TOP: Factoring Polynomials
KEY: higher power

125 ANS:

2%



PTS: 2              REF: 081919aii      TOP: Normal Distributions
KEY: percent

126 ANS:

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

$1.00643^{12} \approx 1.08$

PTS: 2              REF: 081808aii      TOP: Modeling Exponential Functions

127 ANS:

$(x + 8)(x + 2)$

$u = x + 3 \qquad u^2 + 4u - 5$

$(u + 5)(u - 1)$

$(x + 3 + 5)(x + 3 - 1)$

$(x + 8)(x + 2)$

PTS: 2              REF: 062401aii      TOP: Factoring Polynomials

128 ANS:

3

$6x + 8y - 10z = -54 \quad 6x + 8y - 10z = -54 \quad 6x + 9y - 3z = -9 \quad 10y - 7z = -12$

$6x + 9y - 3z = -9 \quad \underline{6x + 9y - 3z = -9} \quad \underline{6x - y + 4z = 3} \qquad \underline{y + 7z = 45}$

$6x - y + 4z = 3 \qquad\qquad y + 7z = 45 \qquad 10y - 7z = -12 \qquad\quad 11y = 33$

$y = 3$

PTS: 2              REF: 082421aii      TOP: Solving Linear Systems
KEY: three variables

129 ANS:

$c(x) = 0.2x^2 - 100x + 300$

$p(x) = r(x) - c(x)$

$-0.5x^2 + 250x - 300 = -0.3x^2 + 150x - c(x)$

$c(x) = 0.2x^2 - 100x + 300$

PTS: 2              REF: 061813aii      TOP: Operations with Functions

130 ANS:

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

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

$$2x + 6 = 4x^2$$

$$4x^2 - 2x - 6 = 0$$

$$2\left(2x^2 - x - 3\right) = 0$$

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

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

PTS: 2      REF: 061809aii      TOP: Solving Rationals

131 ANS:

{5}

$$(x - 1)^2 = 2x + 6 \quad -1 \text{ is extraneous.}$$

$$x^2 - 2x + 1 = 2x + 6$$

$$x^2 - 4x - 5 = 0$$

$$(x - 5)(x + 1) = 0$$

$$x = 5, -1$$

PTS: 2      REF: 082411aii      TOP: Solving Radicals

132 ANS:

{ }

$$x(x-2)\left(\frac{10}{x^2 - 2x} + \frac{4}{x} = \frac{5}{x-2}\right) \quad 2 \text{ is extraneous.}$$

$$10 + 4(x - 2) = 5x$$

$$10 + 4x - 8 = 5x$$

$$2 = x$$

PTS: 2      REF: 081915aii      TOP: Solving Rationals
KEY: rational solutions

133 ANS:

Yes, because $P(N) \bullet P(W) = P(N \cap W)$.

$$\frac{8+12}{120} \bullet \frac{8+40}{120} = \frac{8}{120}$$

$$\frac{1}{6} \bullet \frac{4}{10} = \frac{1}{15}$$

$$\frac{4}{60} = \frac{1}{15}$$

PTS: 2          REF: 082422aii     TOP: Conditional Probability

134 ANS:

$G(x) - C$

PTS: 2          REF: 081817aii     TOP: Transformations with Functions

135 ANS:

2360

$$S_5 = \frac{350 - 350(1.15)^5}{1 - 1.15} \approx 2360$$

PTS: 2          REF: 012524aii     TOP: Series          KEY: geometric

136 ANS:

−5 and 0

```
3   1   -1   -21   45   0
        3    6    -45   0
    1   2   -15    0    0
```

$x^3 + 2x^2 - 15x = 0$

$x(x^2 + 2x - 15) = 0$

$x(x + 5)(x - 3) = 0$

$x = 0, -5, 3$

PTS: 2          REF: 012403aii     TOP: Solving Polynomial Equations

137 ANS:

I, only

$(2x - 3)^2 = 4x^2 - 12x + 9$   $(x - 2)^3 = (x - 2)(x - 2)^2 = (x - 2)(x^2 - 4x + 4)$

$s = 4$                $s = -4$ and $4$

PTS: 2          REF: 062405aii     TOP: Polynomial Identities

138  ANS:
−7

$z = 7y - 31$  $5x + 2y - (7y - 31) = -14$  →  $5x - 5y = -45$  →  $x - y = -9$  →  $y = x + 9$

$5y + 4(7y - 31) - 5x = -23$  →  $-5x + 33y = 101$

$-5x + 33(x + 9) = 101$

$28x = -196$

$x = -7$

PTS:  2          REF:  012515aii     TOP:  Solving Linear Systems
KEY:  three variables

139  ANS:

$x(x + 3)(x - 3)(x + 4)$

$x(x^3 + 4x^2 - 9x - 36)$

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

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

$x(x + 3)(x - 3)(x + 4)$

PTS:  2          REF:  062407aii     TOP:  Factoring Polynomials

140  ANS:
8
$49 \times 16.7\% \approx 8$

PTS:  2          REF:  062418aii     TOP:  Normal Distributions
KEY:  predict

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

PTS:  2          REF:  081823aii     TOP:  Graphing Quadratic Functions

142  ANS:

$y = -3\sin\left(\dfrac{\pi}{3}x\right) + 5$

amplitude $= \dfrac{8-2}{2} = 3,\ b = \dfrac{2\pi}{6} = \dfrac{\pi}{3},\ c = \dfrac{8+2}{2} = 5$

PTS:  2          REF:  062403aii     TOP:  Modeling Trigonometric Functions

143  ANS:

$P(t) = 3500(1.00206)^{12t}$

$1.025^{\frac{1}{12}} \approx 1.00206$

PTS:  2          REF:  081924aii     TOP:  Modeling Exponential Functions

144 ANS:

$(1,2)$ and $(-1,-2)$

$x^2 + (2x)^2 = 5 \quad y = 2x = \pm 2$

$\quad x^2 + 4x^2 = 5$

$\qquad 5x^2 = 5$

$\qquad x = \pm 1$

PTS: 2        REF: 081916aii     TOP: Quadratic-Linear Systems

145 ANS:

$-3 \pm i$

$x^2 + 6x + 9 = -10 + 9$

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

$\qquad x + 3 = \pm i$

$\qquad x = -3 \pm i$

PTS: 2        REF: 012416aii     TOP: Solving Quadratics

KEY: complex solutions | completing the square

146 ANS:

$\pm i$

$\quad wx^2 + w = 0$

$w(x^2 + 1) = 0$

$\qquad x^2 = -1$

$\qquad x = \pm i$

PTS: 2        REF: 061912aii     TOP: Solving Quadratics

KEY: complex solutions | taking square roots

147 ANS:

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

$V(x) = x(18 - 2x)(18 - 2x) = x(324 - 72x + 4x^2) = 324x - 72x^2 + 4x^3$

PTS: 2        REF: 082418aii     TOP: Operations with Functions

148 ANS:

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

$\dfrac{c^2 - d^2}{d^2 + cd - 2c^2} = \dfrac{(c+d)(c-d)}{(d+2c)(d-c)} = \dfrac{-(c+d)}{d+2c} = \dfrac{-c-d}{d+2c}$

PTS: 2        REF: 011818aii     TOP: Rational Expressions

KEY: factoring

149 ANS:

$$\frac{7}{8} \pm \frac{\sqrt{79}}{8} i$$

$$4x^2 - 7x + 8 = 0 \quad x = \frac{7 \pm \sqrt{(-7)^2 - 4(4)(8)}}{2(4)} = \frac{7 \pm \sqrt{-79}}{8}$$

PTS: 2          REF: 012507aii      TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

150 ANS:

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

PTS: 2          REF: 012501aii      TOP: Determining Trigonometric Functions
KEY: radians

151 ANS:

[1, 10]

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

PTS: 2          REF: 061807aii      TOP: Rate of Change
KEY: exponential

152 ANS:

$$5(2^{\frac{x}{2}})$$

PTS: 2          REF: 061906aii      TOP: Families of Functions

153 ANS:

$-3$

PTS: 2          REF: 081904aii      TOP: Factoring Polynomials
KEY: higher power

154 ANS:

exponential function

PTS: 2          REF: 081903aii      TOP: Families of Functions

155 ANS:

2.29 and 3.63

PTS: 2          REF: 011814aii      TOP: Other Systems
KEY: logarithmic

156 ANS:
0.2743



PTS: 2          REF: 061817aii     TOP: Normal Distributions
KEY: probability

157 ANS:
−0.087

$$100\left(\frac{1}{2}\right)^{\frac{d}{8}} = 100e^{kd}$$

$$\left(\frac{1}{2}\right)^{\frac{1}{8}} = e^{k}$$

$$k \approx -0.087$$

PTS: 2          REF: 061818aii     TOP: Exponential Decay

158 ANS:
$\log_{\frac{1}{2}}(p) = q$

PTS: 2          REF: 012404aii     TOP: Express Exponentials as Logarithms

159 ANS:
−12

$\sqrt{4-x} = x + 8$                    $-12 + 8 = -4$

$4 - x = x^2 + 16x + 64$

$0 = x^2 + 17x + 60$

$x = (x+12)(x-5) + x = -12, 5$

PTS: 2          REF: 012521aii     TOP: Solving Radicals

160 ANS:

$$\frac{\log(3)+2}{5}$$

$$10^{5x-2}=3$$

$$\log 10^{5x-2}=\log 3$$

$$(5x-2)\log 10=\log 3$$

$$5x-2=\log 3$$

$$5x=\log 3+2$$

$$x=\frac{\log 3+2}{5}$$

PTS: 2     REF: 012517aii     TOP: Exponential Equations
KEY: without common base

161 ANS:

$$-9x^2+12xi+10$$
$$6-(3x-2i)(3x-2i)=6-\left(9x^2-12xi+4i^2\right)=6-9x^2+12xi+4=-9x^2+12xi+10$$

PTS: 2     REF: 061915aii     TOP: Operations with Complex Numbers

162 ANS:

$$\{(0,6),(-5,-9)\}$$

$$(x+4)^2-10=3x+6 \quad y=3(-5)+6=-9$$

$$x^2+8x+16-10=3x+6 \quad y=3(0)+6=6$$

$$x^2+5x=0$$

$$x(x+5)=0$$

$$x=-5,0$$

PTS: 2     REF: 061903aii     TOP: Quadratic-Linear Systems

163 ANS:

34

$$121(b)^2=64 \quad 64\left(\frac{8}{11}\right)^2\approx 34$$

$$b=\frac{8}{11}$$

PTS: 2     REF: 011904aii     TOP: Sequences     KEY: explicit

164 ANS:
14.066

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

$$x = \frac{\ln \dfrac{5918}{87}}{0.3}$$
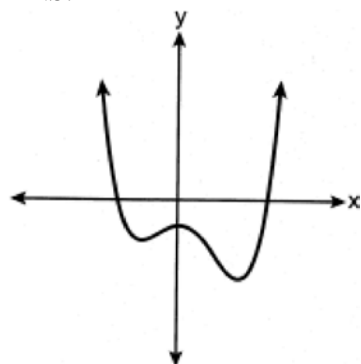
PTS: 2      REF: 081801aii      TOP: Exponential Equations
KEY: without common base

165 ANS:



PTS: 2      REF: 082414aii      TOP: Graphing Polynomial Functions

166 ANS:
{8}

$b^2 = 2b^2 - 64$   −8 is extraneous.

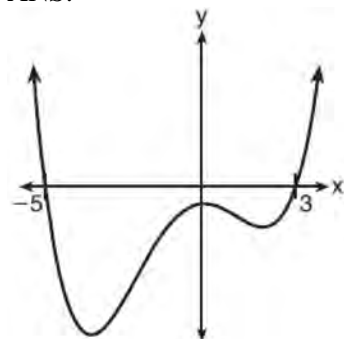$-b^2 = -64$

$b = \pm 8$

PTS: 2      REF: 061919aii      TOP: Solving Radicals
KEY: extraneous solutions

167 ANS:



PTS: 2      REF: 061816aii      TOP: Graphing Polynomial Functions
KEY: bimodalgraph

168  ANS:

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

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

$$xy + 2x = y$$

$$xy - y = -2x$$

$$y(x-1) = -2x$$

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

PTS:  2          REF:  081924aii     TOP:  Inverse of Functions
KEY:  rational

**Algebra II Regents Bimodal Worksheets**
**Answer Section**

169 ANS:
0.03

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

PTS: 2          REF: 081612aii     TOP: Analysis of Data

170 ANS:

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

$$\ln e^{x+2} = \ln\frac{7}{5}$$

$$(x+2)\ln e = \ln\frac{7}{5}$$

$$x = -2 + \ln\frac{7}{5}$$

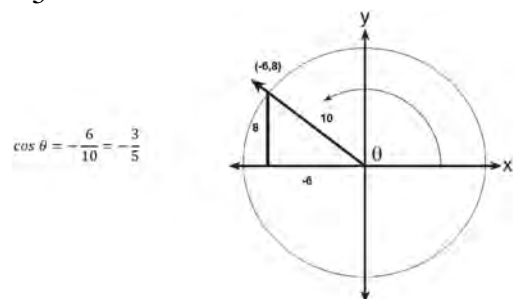PTS: 2          REF: 062207aii     TOP: Exponential Equations
KEY: without common base

171 ANS:

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

PTS: 2          REF: 082309aii     TOP: Modeling Exponential Functions

172 ANS:

$$-\frac{3}{5}$$



$$\cos\theta = -\frac{6}{10} = -\frac{3}{5}$$

PTS: 2          REF: 061617aii     TOP: Determining Trigonometric Functions
KEY: extension to reals

173  ANS:
II, only
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 $P(A \text{ or } B) = P(A) + P(B)$
$$0.625 \neq 0.5 + 0.25$$

PTS: 2          REF: 061714aii     TOP: Conditional Probability
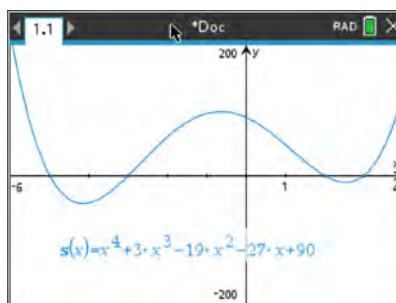
174  ANS:
$I = I_0 (0.0067)^t$

$e^{\left(-\frac{3}{0.6}\right)} \approx 0.006738$

PTS: 2          REF: 062315aii     TOP: Modeling Exponential Functions

175  ANS:
$\{-5, -3, 2, 3\}$



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

$\quad = x^2(x^2 - 9) + 3x(x^2 - 9) - 10(x^2 - 9)$

$\quad = (x^2 + 3x - 10)(x^2 - 9)$

$\quad = (x + 5)(x - 2)(x + 3)(x - 3)$

PTS: 2          REF: 062303aii     TOP: Solving Polynomial Equations

176  ANS:
$a_n = 2 \cdot 3^n$

PTS: 2          REF: 081618aii     TOP: Sequences     KEY: recursive

177 ANS:

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

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

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

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

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

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

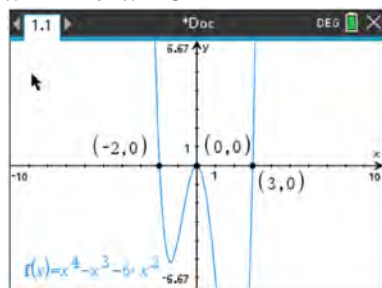PTS: 2          REF: 081615aii          TOP: Factoring Polynomials
KEY: factoring by grouping
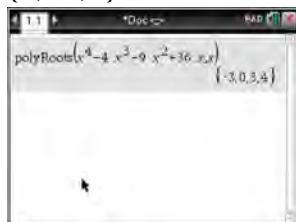
178 ANS:

$x < -2$ or $x > 3$



PTS: 2          REF: 012316aii          TOP: Graphing Polynomial Functions

179 ANS:

$\{0, \pm 3, 4\}$



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

PTS: 2          REF: 061606aii          TOP: Solving Polynomial Equations

180 ANS:

1,850,000

$y = 1.77(1.18)^x$   $y(41) \approx 1,850,950$

PTS: 2          REF: 062314aii          TOP: Regression          KEY: exponential

181 ANS:
very loud

$$d = 10\log\frac{6.3 \times 10^{-3}}{1.0 \times 10^{-12}} \approx 98$$

PTS: 2      REF: 011715aii      TOP: Evaluating Logarithmic Expressions

182 ANS:

$$A(t) = A_0(0.000178)^t$$

$$0.5^{\frac{1}{0.0803}} \approx 0.000178$$

PTS: 2      REF: 082224aii      TOP: Modeling Exponential Functions

183 ANS:

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

The distance from the vertex to the focus, $p$, is 4. Since the focus is below the vertex, $p$ is negative.

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

PTS: 2      REF: 082212aii      TOP: Graphing Quadratic Functions

184 ANS:

$-3a + 18i$

$3i(ai - 6i^2) = 3ai^2 - 18i^3 = -3a + 18i$

PTS: 2      REF: 062307aii      TOP: Operations with Complex Numbers

185 ANS:

$$x = \frac{\ln 6}{\ln 2} - 3$$

$$8(2^{x+3}) = 48$$

$$2^{x+3} = 6$$

$$(x + 3)\ln 2 = \ln 6$$

$$x + 3 = \frac{\ln 6}{\ln 2}$$

$$x = \frac{\ln 6}{\ln 2} - 3$$

PTS: 2      REF: 061702aii      TOP: Exponential Equations
KEY: without common base

186 ANS:
$-1$

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

$$2x-8+3x+9 = 2x-2$$

$$3x = -3$$

$$x = -1$$

PTS: 2        REF: 011717aii        TOP: Solving Rationals
KEY: rational solutions

187 ANS:
$x^2 - 2x + 2 = 0$
If $1-i$ is one solution, the other is $1+i$.        $(x-(1-i))(x-(1+i)) = 0$

$$x^2 - x - ix - x + ix + (1-i^2) = 0$$

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

PTS: 2        REF: 081601aii        TOP: Complex Conjugate Root Theorem

188 ANS:
0.07
$2 \times 0.035 = 0.07$

PTS: 2        REF: 012319aii        TOP: Analysis of Data

189 ANS:
4.78

PTS: 2        REF: 082313aii        TOP: Normal Distributions
KEY: percent

190 ANS:
149

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

PTS: 2        REF: 081721aii        TOP: Series        KEY: geometric

191 ANS:

$$\frac{FW}{W-F}$$

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

$$\frac{1}{J} = \frac{W-F}{FW}$$

$$J = \frac{FW}{W-F}$$

PTS: 2    REF: 081617aii    TOP: Solving Rationals
KEY: rational solutions

192 ANS:

$x + 2$

PTS: 2    REF: 082324aii    TOP: Graphing Polynomial Functions

193 ANS:

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

$$
\begin{array}{r}
x^2 - 2x + 5 \\
2x+4 \overline{)\, 2x^3 + 0x^2 + 2x - 7} \\
\underline{2x^3 + 4x^2} \\
-4x^2 + 2x \\
\underline{-4x^2 - 8x} \\
10x - 7 \\
\underline{10x + 20} \\
-27
\end{array}
$$

PTS: 2    REF: 062313aii    TOP: Rational Expressions
KEY: division

194 ANS:

$300e^{-0.87}$

$$\frac{A}{P} = e^{rt}$$

$$0.42 = e^{rt}$$

$$\ln 0.42 = \ln e^{rt}$$

$$-0.87 \approx rt$$

PTS: 2    REF: 011723aii    TOP: Modeling Exponential Functions

195 ANS:

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

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

PTS: 2        REF: 081619aii       TOP: Graphing Quadratic Functions

196 ANS:

$\{3\}$

$\frac{x+2}{x} + \frac{x}{3} = \frac{2x^2+6}{3x}$   0 is extraneous.

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

$x^2 + 3x + 6 = 2x^2 + 6$

$\quad x^2 - 3x = 0$

$\quad x(x-3) = 0$

$\qquad x = 0, 3$

PTS: 2        REF: 012309aii       TOP: Solving Rationals

197 ANS:

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

$\text{period} = \frac{2\pi}{B}$

$\frac{1}{60} = \frac{2\pi}{B}$

$\quad B = 120\pi$

PTS: 2        REF: 061624aii       TOP: Modeling Trigonometric Functions

198 ANS:

13

$40 - (20 + 22 - 15) = 13$

PTS: 2        REF: 062204aii       TOP: Addition Rule

199 ANS:

$x^3 - y^3 i$

$x^3 - x^2 yi - xy^2 + x^2 yi - xy^2 i^2 - y^3 i = x^3 - xy^2 - xy^2(-1) - y^3 i = x^3 - y^3 i$

PTS: 2        REF: 062223aii       TOP: Operations with Complex Numbers

200 ANS:

$-\dfrac{3}{4} + \dfrac{1}{4}i\sqrt{7}$

$x = \dfrac{-3 \pm \sqrt{3^2 - 4(2)(2)}}{2(2)} = \dfrac{-3 \pm \sqrt{-7}}{4} = -\dfrac{3}{4} \pm \dfrac{i\sqrt{7}}{4}$

PTS: 2       REF: 061612aii     TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

201 ANS:

$1835.98

$M = \dfrac{240000\left(\dfrac{4.5\%}{12}\right)\left(1 + \dfrac{4.5\%}{12}\right)^{15 \times 12}}{\left(1 + \dfrac{4.5\%}{12}\right)^{15 \times 12} - 1} \approx 1835.98$

PTS: 2       REF: 062209aii     TOP: Evaluating Exponential Expressions

202 ANS:

$(1.00427)^m$

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

PTS: 2       REF: 061621aii     TOP: Modeling Exponential Functions

203 ANS:

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

$$
\begin{array}{r}
x^3 - 2x^2 - x + 6 \\
x + 2 \overline{\smash{)}\, x^4 + 0x^3 - 5x^2 + 4x + 14} \\
\underline{x^4 + 2x^3} \phantom{xxxxxxxxxxxxx} \\
-2x^3 - 5x^2 \phantom{xxxxxxx} \\
\underline{-2x^3 - 4x^2} \phantom{xxxxxxx} \\
-x^2 + 4x \phantom{xx} \\
\underline{-x^2 - 2x} \phantom{xx} \\
6x + 14 \\
\underline{6x + 12} \\
2
\end{array}
$$

PTS: 2       REF: 012305aii     TOP: Rational Expressions
KEY: division

204 ANS:
$(2,-1)$

The vertical distance from the directrix to the vertex, $p$, is 2. The vertical distance from the vertex to the focus must also be 2.

PTS: 2      REF: 062213aii      TOP: Graphing Quadratic Functions

205 ANS:
$2\pi$

$$1 = \frac{2\pi}{k}$$

$$k = 2\pi$$

PTS: 2      REF: 012313aii      TOP: Modeling Trigonometric Functions

206 ANS:
$-8.93$

$$\frac{N(6) - N(0)}{6 - 0} \approx -8.93$$

PTS: 2      REF: 012012aii      TOP: Rate of Change
KEY: exponential

207 ANS:
left $a$ units, down $b$ units

PTS: 2      REF: 061706aii      TOP: Graphing Trigonometric Functions

208 ANS:
$32°$

PTS: 2      REF: 011704aii      TOP: Proving Trigonometric Identities
KEY: basic

209 ANS:

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

$$x = 12y - 4$$

$$x + 4 = 12y$$

$$\frac{x+4}{12} = y$$

PTS: 2      REF: 082304aii      TOP: Inverse of Functions
KEY: linear

210 ANS:

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

The distance between the focus and directrix is $1 - -3 = 4$. $p$ is half this distance, or 2. The vertex of the parabola

is $(4, -1)$. Since the directrix is above the focus, the parabola faces downward. $y = -\dfrac{1}{4p}(x - h)^2 + k$

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

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

PTS: 2          REF: 012322aii     TOP: Graphing Quadratic Functions

211 ANS:

$\dfrac{\sqrt{6}}{5}$

$5x^2 - 4x + 2 = 0 \quad \dfrac{4 \pm \sqrt{(-4)^2 - 4(5)(2)}}{2(5)} = \dfrac{4 \pm \sqrt{-24}}{10} = \dfrac{4 \pm 2i\sqrt{6}}{10} = \dfrac{2 \pm i\sqrt{6}}{5}$

PTS: 2          REF: 012020aii     TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

212 ANS:

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

PTS: 2          REF: 061722aii     TOP: Modeling Rationals

213 ANS:

{6}

$\sqrt{3x + 18} = x \qquad -3$ is extraneous.

$3x + 18 = x^2$

$x^2 - 3x - 18 = 0$

$(x - 6)(x + 3) = 0$

$x = 6, -3$

PTS: 2          REF: 082315aii     TOP: Solving Radicals
KEY: extraneous solutions

214 ANS:

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

$\cos \theta = \pm \sqrt{1 - \left(\dfrac{-\sqrt{2}}{5}\right)^2} = \pm \sqrt{\dfrac{25}{25} - \dfrac{2}{25}} = \pm \dfrac{\sqrt{23}}{5}$

PTS: 2          REF: 061712aii     TOP: Determining Trigonometric Functions

215 ANS:

$$\pm\frac{7i\sqrt{2}}{2}$$

$$4x^2 = -98$$

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

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

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

PTS: 2          REF: 061707aii     TOP: Solving Quadratics
KEY: complex solutions | taking square roots

216 ANS:

$$P = 714(0.9716)^y$$

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

PTS: 2          REF: 061713aii     TOP: Modeling Exponential Functions

217 ANS:

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

$$
\begin{array}{r}
x^2 + 0x + 1 \\
x+2 \overline{\smash{\big)}\ x^3 + 2x^2 + x + 6} \\
\underline{x^3 + 2x^2} \\
0x^2 + x \\
\underline{0x^2 + 0x} \\
x + 6 \\
\underline{x + 2} \\
4
\end{array}
$$

PTS: 2          REF: 081611aii     TOP: Rational Expressions
KEY: division

218 ANS:

$$x^2 - 4xi - 4$$

$$(x - 2i)(x - 2i) = x^2 - 4xi + 4i^2 = x^2 - 4xi - 4$$

PTS: 2          REF: 082202aii     TOP: Operations with Complex Numbers

219 ANS:

$$f^{-1}(x) = -\frac{1}{6}x + \frac{1}{12}$$

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

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

$$x - \frac{1}{2} = -6y$$

$$-\frac{1}{6}\left(x - \frac{1}{2}\right) = y$$

PTS: 2          REF: 062217aii          TOP: Inverse of Functions
KEY: linear

220 ANS:

$$-24x^2 - 30xi$$
$$6xi^3(-4xi + 5) = -24x^2 i^4 + 30xi^3 = -24x^2(1) + 30x(-1) = -24x^2 - 30xi$$

PTS: 2          REF: 061704aii          TOP: Operations with Complex Numbers

221 ANS:

$$-12x$$
$$x^2 - 6x + 9 - \left(x^2 + 6x + 9\right) = -12x$$
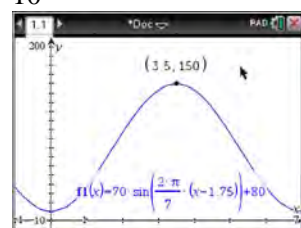
PTS: 2          REF: 062210aii          TOP: Operations with Functions

222 ANS:

10

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

PTS: 2          REF: 061613aii          TOP: Graphing Trigonometric Functions
KEY: maximum/minimum

223 ANS:

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

PTS: 2          REF: 061708aii          TOP: Modeling Trigonometric Functions

224 ANS:

$g_1 = 18$

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

(2) is not recursive

PTS: 2  REF: 081608aii  TOP: Sequences  KEY: recursive

225 ANS:

$y = -h(x)$

PTS: 2  REF: 062205aii  TOP: Transformations with Functions

226 ANS:

7

$50(.9)^t = 25$

$\quad t \approx 6.57$

PTS: 2  REF: 082317aii  TOP: Exponential Decay

227 ANS:

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

$\quad x = -\dfrac{3}{4} y + 2$

$\quad -4x = 3y - 8$

$\quad -4x + 8 = 3y$

$-\dfrac{4}{3} x + \dfrac{8}{3} = y$

PTS: 2  REF: 061616aii  TOP: Inverse of Functions
KEY: linear

228 ANS:

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

$x = \dfrac{8 \pm \sqrt{(-8)^2 - 4(6)(29)}}{2(6)} = \dfrac{8 \pm \sqrt{-632}}{12} = \dfrac{8 \pm i\sqrt{4}\sqrt{158}}{12} = \dfrac{2}{3} \pm \dfrac{1}{6} i\sqrt{158}$

PTS: 2  REF: 011711aii  TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

229 ANS:

$h(x) = \log(x + a) + c$

PTS: 2  REF: 062308aii  TOP: Graphing Logarithmic Functions

230 ANS:

$$\frac{64+x}{80+x} = \frac{90}{100}$$

PTS: 2    REF: 082222aii  TOP: Modeling Rationals

231 ANS:

0

$$\frac{1}{2}x^2 + 2x = \frac{1}{4}x - 8 \qquad b^2 - 4ac$$

$$2x^2 + 8x = x - 32 \qquad 7^2 - 4(2)(32) < 0$$

$$2x^2 + 7x + 32 = 0$$

PTS: 2    REF: 012310aii  TOP: Quadratic-Linear Systems

232 ANS:

$$2x^2 + x + 5$$

$$
\begin{array}{r}
2x^2 + x + 5 \\
2x - 1 \overline{)\, 4x^3 + 0x^2 + 9x - 5} \\
\underline{4x^3 - 2x^2} \\
2x^2 + 9x \\
\underline{2x^2 - x} \\
10x - 5 \\
\underline{10x - 5}
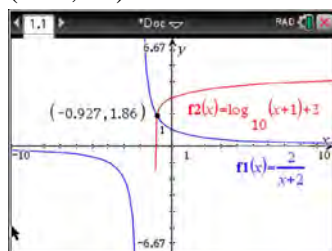\end{array}
$$

PTS: 2    REF: 081713aii  TOP: Rational Expressions
KEY: division

233 ANS:

$(-0.9, 1.9)$



PTS: 2    REF: 011712aii  TOP: Other Systems
KEY: rational

234 ANS:

$P(t) = 500(1.00247)^{12t}$

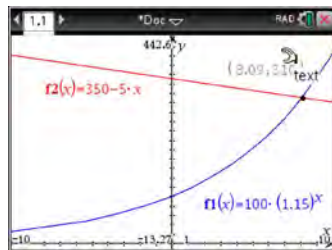$$\left(1.03^{\frac{1}{12}}\right)^{12t} \approx 1.00247^{12t}$$

PTS: 2      REF: 062224aii      TOP: Modeling Exponential Functions

235 ANS:

8



PTS: 2      REF: 011716aii      TOP: Other Systems

KEY: exponential

236 ANS:

8.5

$a_2 = 8 + \log_{2+1} 1 = 8 + 0 = 8$

$a_3 = 8 + \log_{3+1} 2 = 8 + \dfrac{1}{2} = 8.5$

PTS: 2      REF: 062221aii      TOP: Sequences      KEY: recursive

237 ANS:

$2x^2 + x - 6 - \dfrac{7}{x+3}$

$$
\begin{array}{r}
2x^2 + x - 6 \\
x+3 \overline{\smash{)}\ 2x^3 + 7x^2 - 3x - 25} \\
\underline{2x^3 + 6x^2} \\
x^2 - 3x \\
\underline{x^2 + 3x} \\
-6x - 25 \\
\underline{-6x - 18} \\
-7
\end{array}
$$

PTS: 2      REF: 062203aii      TOP: Rational Expressions

KEY: division

238 ANS:

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

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

PTS: 2          REF: fall1503aii    TOP: Rational Expressions
KEY: division

239 ANS:

$6 \pm 2i$

$-2\left(-\dfrac{1}{2}x^2 = -6x + 20\right)$

$x^2 - 12x = -40$

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

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

$x - 6 = \pm 2i$

$x = 6 \pm 2i$

PTS: 2          REF: fall1504aii    TOP: Solving Quadratics
KEY: complex solutions | completing the square

240 ANS:

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

PTS: 2          REF: 081622aii    TOP: Modeling Exponential Functions

241 ANS:

150°

PTS: 2          REF: 082205aii    TOP: Unit Circle

242 ANS:

$2ab\sqrt[3]{a^2}$

$\left(a\sqrt[3]{2b^2}\right)\left(\sqrt[3]{4a^2 b}\right) = a\sqrt[3]{8a^2 b^3} = 2ab\sqrt[3]{a^2}$

PTS: 2          REF: 082213aii    TOP: Radicals and Rational Exponents

243 ANS:

$P = 12,150(0.679)^d$

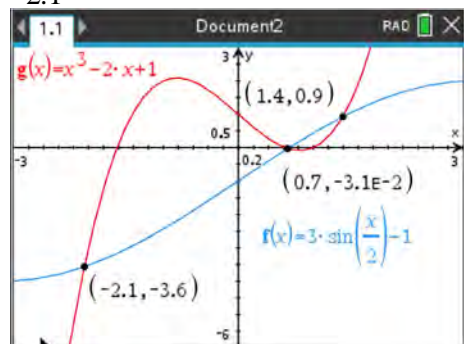$.962^{10} \approx .679$

PTS: 2               REF: 082311aii      TOP: Modeling Exponential Functions

244 ANS:

−2.1



PTS: 2               REF: 012021aii      TOP: Other Systems

KEY: trigonometric

245 ANS:

$2x^2 - 3x + 7 - \dfrac{11}{2x + 3}$

$$2x + 3 \overline{)\,4x^3 + 0x^2 + 5x + 10\,}$$

quotient $2x^2 - 3x + 7$

$\underline{4x^3 + 6x^2}$

$-6x^2 + 5x$

$\underline{-6x^2 - 9x}$

$14x + 10$

$\underline{14x + 21}$

$-11$

PTS: 2               REF: 061614aii      TOP: Rational Expressions

KEY: division

246 ANS:

I

$\dfrac{-12}{16} = \dfrac{9}{-12} = \dfrac{-6.75}{9}$

PTS: 2               REF: 012017aii      TOP: Sequences      KEY: difference or ratio

247 ANS:

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

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

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

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

$$y(x-1) = 2x + 1$$

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

PTS: 2 REF: 081714aii TOP: Inverse of Functions
KEY: rational

248 ANS:
(3,1)

$$y = -(x-1)^2 + 5 \qquad 3 + y = 4$$
$$4 - x = -x^2 + 2x - 1 + 5 \qquad y = 1$$
$$x^2 - 3x = 0$$
$$x(x-3) = 0$$
$$x = 0, 3$$

PTS: 2 REF: 082305aii TOP: Quadratic-Linear Systems

249 ANS:
$-x$

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

PTS: 2 REF: 012023aii TOP: Rational Expressions
KEY: factoring

250 ANS:
$\frac{13}{24}$

$$\frac{13}{13+11} = \frac{13}{24}$$

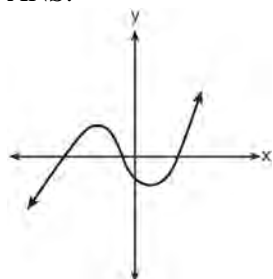PTS: 2 REF: 012011aii TOP: Conditional Probability

251 ANS:
2

PTS: 2 REF: 062219aii TOP: Unit Circle

252 ANS:



The graph shows three real zeros, and has end behavior matching the given end behavior.

PTS: 2      REF: 061604aii      TOP: Graphing Polynomial Functions
KEY: bimodalgraph

253 ANS:

$a_1 = 64$

$a_n = 0.75a_{n-1}$

1) is a correct formula, but not recursive

PTS: 2      REF: 082216aii      TOP: Sequences      KEY: recursive

254 ANS:
2.5

$4300e^{0.07x} = 5123$

$$\ln e^{0.07x} = \ln \frac{5123}{4300}$$

$$0.07x = \ln \frac{5123}{4300}$$

$$x = \frac{\ln \dfrac{5123}{4300}}{0.07}$$

$$x \approx 2.5$$

PTS: 2      REF: 012302aii      TOP: Exponential Equations
KEY: without common base

255 ANS:

$g_1 = 40$

$g_n = \dfrac{3}{4} g_{n-1}$

(1) and (3) are not recursive

PTS: 2      REF: 012013aii      TOP: Sequences      KEY: recursive

256 ANS:
1660

PTS: 2      REF: 062214aii      TOP: Normal Distributions
KEY: predict

257 ANS:
4.8

PTS: 2          REF: 082203aii     TOP: Graphing Trigonometric Functions
KEY: amplitude
258 ANS:
$496 \pm 230$
$496 \pm 2(115)$

PTS: 2          REF: 011718aii     TOP: Normal Distributions
KEY: interval
259 ANS:

$f(x) = \dfrac{3}{2}x - \dfrac{1}{4}$

$x = \dfrac{2}{3}y + \dfrac{1}{6}$

$6x = 4y + 1$

$4y = 6x - 1$

$y = \dfrac{6}{4}x - \dfrac{1}{4}$

PTS: 2          REF: 062321aii     TOP: Inverse of Functions
KEY: linear
260 ANS:

$\dfrac{x}{x+2}$

$\dfrac{x^2 + 3x}{x^2 + 5x + 6} = \dfrac{x(x+3)}{(x+2)(x+3)}$

PTS: 2          REF: 082215aii     TOP: Rational Expressions
KEY: factoring
261 ANS:
II, only
The mass of the carbon-14 is decreasing by half every 5715 years.

PTS: 2          REF: 062211aii     TOP: Modeling Exponential Functions
262 ANS:
$2000(1.003)^{12t}$

$2000\left(1 + \dfrac{.032}{12}\right)^{12t} \approx 2000(1.003)^{12t}$

PTS: 2          REF: 012004aii     TOP: Modeling Exponential Functions

263 ANS:

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

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

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

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

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

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

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

PTS: 2        REF: fall1501aii    TOP: Solving Rationals
KEY: rational solutions

264 ANS:

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

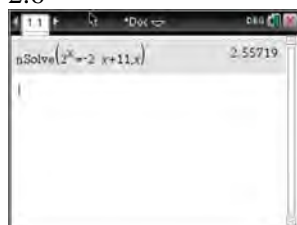$$\left(\frac{1}{2}\right)^{\frac{1}{73.83}}\approx 0.990656$$

PTS: 2        REF: 081710aii    TOP: Modeling Exponential Functions

265 ANS:
2.6



PTS: 2        REF: 081603aii    TOP: Other Systems
KEY: exponential

266 ANS:
{8}

$$x^2=3x+40.\ x=-5 \text{ is an extraneous solution.}$$

$$x^2-3x-40=0$$

$$(x-8)(x+5)=0$$

$$x=8,-5$$

PTS: 2        REF: 012010aii    TOP: Solving Radicals
KEY: extraneous solutions

267 ANS:
$2, -2, i$, and $-i$

PTS: 2　　　　REF: 081708aii　　TOP: Solving Polynomial Equations

268 ANS:
$x^2 - 6x + 10 = 0$

The product of the roots equals $(3 + i)(3 - i) = 9 - i^2 = 10 = \dfrac{c}{a}$.　OR

$(x - (3 + i))(x - (3 - i)) = 0$

$\qquad (x - 3 - i)(x - 3 + i) = 0$
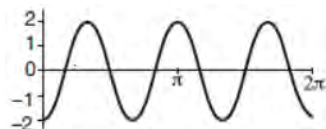
$((x - 3) - i)((x - 3) + i) = 0$

$\qquad\qquad (x - 3)^2 - i^2 = 0$

$\qquad\qquad x^2 - 6x + 9 + 1 = 0$

$\qquad\qquad\quad x^2 - 6x + 10 = 0$

PTS: 2　　　　REF: 082208aii　　TOP: Complex Conjugate Root Theorem

269 ANS:



(3) repeats 3 times over $2\pi$.

PTS: 2　　　　REF: 011722aii　　TOP: Graphing Trigonometric Functions
KEY: recognize | bimodalgraph

270 ANS:
II, only
The 2010 population is 110 million.

PTS: 2　　　　REF: 061718aii　　TOP: Modeling Exponential Functions

271 ANS:
[33, 79]
$-23(1) + 56 = 33; \ -23(-1) + 56 = 79$

PTS: 2　　　　REF: 062305aii　　TOP: Graphing Trigonometric Functions

272 ANS:
$1 + \dfrac{2}{x^2 + 4}$

$\dfrac{x^2 + 6}{x^2 + 4} = \dfrac{x^2 + 4}{x^2 + 4} + \dfrac{2}{x^2 + 4} = 1 + \dfrac{2}{x^2 + 4}$

PTS: 2　　　　REF: 082321aii　　TOP: Addition and Subtraction of Rationals

273 ANS:

$\{-1\}$

$\dfrac{4}{k^2 - 8k + 12} = \dfrac{k(k-6)+(k-2)}{k^2 - 8k + 12}$   $k = 6$ is extraneous

$\qquad\qquad 4 = k^2 - 6k + k - 2$

$\qquad\qquad 0 = k^2 - 5k - 6$

$\qquad\qquad 0 = (k-6)(k+1)$

$\qquad\qquad k = 6, -1$

PTS: 2          REF: 082218aii      TOP: Solving Rationals

274 ANS:

$\dfrac{1}{2}$

$\dfrac{20}{14 + 20 + 6} = \dfrac{1}{2}$

PTS: 2          REF: 082303aii      TOP: Conditional Probability

275 ANS:

0.05

$.43 \pm 2(0.05)$ contains about 95% of the data.

PTS: 2          REF: 062317aii      TOP: Analysis of Data

276 ANS:

I and III

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

PTS: 2          REF: 081620aii      TOP: Polynomial Identities
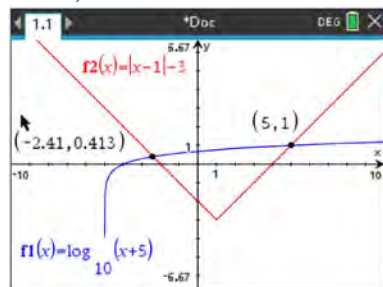
277 ANS:

$y = 3^x$

PTS: 2          REF: 011708aii      TOP: Inverse of Functions

KEY: exponential

278 ANS:

$-2.41, 5$



PTS: 2          REF: 012317aii      TOP: Other Systems

KEY: logarithmic

279  ANS:

$B(t) = 750(1.012)^{12t}$

$B(t) = 750\left(1.16^{\frac{1}{12}}\right)^{12t} \approx 750(1.012)^{12t}$   $B(t) = 750\left(1 + \dfrac{0.16}{12}\right)^{12t}$  is wrong, because the growth is an annual rate

that is not compounded monthly.

PTS: 2          REF: spr1504aii     TOP: Modeling Exponential Functions

280  ANS:

1,743,392,200

$S_{20} = \dfrac{-2 - (-2)(-3)^{20}}{1 - (-3)} = 1,743,392,200$
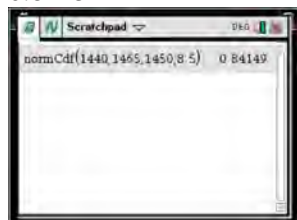
PTS: 2          REF: 012306aii     TOP: Series          KEY: geometric

281  ANS:

0.8415



PTS: 2          REF: 081604aii     TOP: Normal Distributions

KEY: probability

282  ANS:

$x^2 = -4y$

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.  $y = \dfrac{-1}{4p}(x - h)^2 + k$

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

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

PTS: 2          REF: 081706aii     TOP: Graphing Quadratic Functions

283 ANS:
$(0, 2, 0)$

$x + y + z = 2$ $\quad$ $x - 2y - z = -4$ $\qquad$ $2x - y = -2$ $\qquad$ $x + 2 + z = 2$ $\quad$ $x + z = 0$ $\quad$ $0 + 2 + z = 2$

$\underline{x - 2y - z = -4}$ $\quad$ $\underline{x - 9y + z = -18}$ $\quad$ $\underline{2x - 11y = -22}$ $\quad$ $x - 2(2) - z = -4$ $\quad$ $\underline{x - z = 0}$ $\qquad\qquad$ $z = 0$

$\quad\; 2x - y = -2$ $\quad$ $2x - 11y = -22$ $\qquad$ $10y = 20$ $\qquad\qquad\qquad\qquad$ $2x = 0$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ $y = 2$ $\qquad\qquad\qquad\qquad$ $x = 0$

PTS: 2 $\qquad\qquad\qquad$ REF: 062311aii $\qquad$ TOP: Solving Linear Systems
KEY: three variables

284 ANS:
$\dfrac{\ln 1.25}{0.025}$

$\dfrac{15000}{12000} = \dfrac{12000e^{.025t}}{12000}$

$\quad 1.25 = e^{.025t}$

$\ln 1.25 = \ln e^{.025t}$

$\ln 1.25 = .025t$

$\dfrac{\ln 1.25}{.025} = t$

PTS: 2 $\qquad\qquad\qquad$ REF: 082209aii $\qquad$ TOP: Exponential Growth

285 ANS:
$\{(1, 1), (6, 16)\}$

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

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

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

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

$\qquad\qquad\qquad\qquad\qquad\qquad$ $x = 6, 1$

PTS: 2 $\qquad\qquad\qquad$ REF: 011705aii $\qquad$ TOP: Quadratic-Linear Systems

286 ANS:

$x^2 = 4(y - 5)$

Since the distance from the focus to the directrix is 2, $p = 1$ and the vertex of the parabola is $(0,5)$.

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

$$y = \frac{1}{4(1)}(x - 0)^2 + 5$$

$$y = \frac{1}{4}x^2 + 5$$

$$y - 5 = \frac{1}{4}x^2$$

$$4(y - 5) = x^2$$

PTS: 2        REF: 062323aii     TOP: Graphing Quadratic Functions

287 ANS:

I, II, and III

I. $\left(\dfrac{y}{x^3}\right)^{-1} = \dfrac{x^3}{y}$; II. $\sqrt[3]{x^9}\,(y^{-1}) = \dfrac{x^{\frac{9}{3}}}{y} = \dfrac{x^3}{y}$; III. $\dfrac{x^6\sqrt[4]{y^8}}{x^3 y^3} = \dfrac{x^3 y^{\frac{8}{4}}}{y^3} = \dfrac{x^3}{y}$

PTS: 2        REF: 062320aii     TOP: Radicals and Rational Exponents

288 ANS:

$-\dfrac{2}{3}$

$\sin^2 A + \left(\dfrac{\sqrt{5}}{3}\right)^2 = 1$    Since $\tan A < 0$, $\sin A = -\dfrac{2}{3}$

$$\sin^2 A + \frac{5}{9} = \frac{9}{9}$$

$$\sin^2 A = \frac{4}{9}$$

$$\sin A = \pm\frac{2}{3}$$

PTS: 2        REF: 012320aii     TOP: Determining Trigonometric Functions

289 ANS:

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

$x = \dfrac{1}{2}y + 2$

$2x = y + 4$

$y = 2x - 4$

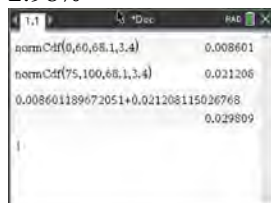PTS: 2    REF: 012315aii    TOP: Inverse of Functions
KEY: linear

290 ANS:

2.98%



PTS: 2    REF: 062316aii    TOP: Normal Distributions
KEY: percent

291 ANS:

$a_0 = 1000$

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

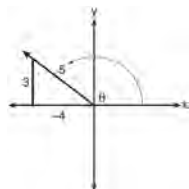PTS: 2    REF: 081724aii    TOP: Sequences    KEY: recursive

292 ANS:

$\dfrac{3}{5}$

A reference triangle can be sketched using the coordinates $(-4, 3)$ in the second quadrant to find the value of $\sin\theta$.



PTS: 2    REF: spr1503aii    TOP: Determining Trigonometric Functions
KEY: extension to reals

293 ANS:

{7}

$\sqrt{56-x} = x$ $\qquad$ $-8$ is extraneous.

$\quad 56 - x = x^2$

$\qquad 0 = x^2 + x - 56$

$\qquad 0 = (x+8)(x-7)$

$\qquad x = 7$

PTS: 2 $\qquad$ REF: 061605aii $\qquad$ TOP: Solving Radicals
KEY: extraneous solutions

294 ANS:

$j_1 = 250,000$

$j_n = 1.00375 j_{n-1}$

PTS: 2 $\qquad$ REF: 061623aii $\qquad$ TOP: Sequences $\qquad$ KEY: recursive

295 ANS:

$g(x)$ and $j(x)$

PTS: 2 $\qquad$ REF: 082308aii $\qquad$ TOP: Using the Discriminant
KEY: determine nature of roots

296 ANS:

{2}

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

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

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

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

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

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

$\qquad x = 2, 22$

PTS: 2 $\qquad$ REF: 081704aii $\qquad$ TOP: Solving Radicals
KEY: advanced

297 ANS:

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

$m^5 + m^3 - 6m = m(m^4 + m^2 - 6) = m(m^2 + 3)(m^2 - 2)$

PTS: 2 $\qquad$ REF: 011703aii $\qquad$ TOP: Factoring Polynomials
KEY: higher power

298 ANS:

$-1 + 2i$ and $-1 - 2i$

$x^2 + 2x + 1 = -5 + 1$

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

$x + 1 = \pm 2i$

$x = -1 \pm 2i$

PTS: 2        REF: 081703aii     TOP: Solving Quadratics
KEY: complex solutions | completing the square

299 ANS:

$2 \pm 3i$

$x^2 - 4x + 4 = -13 + 4$

$(x - 2)^2 = -9$

$x - 2 = \pm 3i$

$x = 2 \pm 3i$

PTS: 2        REF: 062312aii     TOP: Solving Quadratics
KEY: complex solutions | completing the square

300 ANS:

$p(x) = (x^2 - 9)(x - 2)$

PTS: 2        REF: 061701aii     TOP: Graphing Polynomial Functions

301 ANS:

0.0668



PTS: 2        REF: 081711aii     TOP: Normal Distributions
KEY: percent

302 ANS:

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

PTS: 2        REF: 061602aii     TOP: Modeling Rationals

303 ANS:

$(3 - x^2) - (4x + 7)i$

$7 - 3i + x^2 - 4xi + 4i^2 - 4i - 2x^2 = 7 - 7i - x^2 - 4xi - 4 = 3 - x^2 - 4xi - 7i = (3 - x^2) - (4x + 7)i$

PTS: 2          REF: 012022aii     TOP: Operations with Complex Numbers

304 ANS:

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

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

PTS: 2          REF: 061717aii     TOP: Graphing Quadratic Functions

305 ANS:

$-y^2 - 4yi + 4$

$(2 - yi)(2 - yi) = 4 - 4yi + y^2i^2 = -y^2 - 4yi + 4$

PTS: 2          REF: 061603aii     TOP: Operations with Complex Numbers

306 ANS:

56

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

PTS: 2          REF: 011702aii     TOP: Modeling Exponential Functions

307 ANS:

$-0.15x^3 - 0.02x^2 + 28x - 120$

$x(30 - 0.01x) - (0.15x^3 + 0.01x^2 + 2x + 120) = 30x - 0.01x^2 - 0.15x^3 - 0.01x^2 - 2x - 120$

$= -0.15x^3 - 0.02x^2 + 28x - 120$

PTS: 2          REF: 061709aii     TOP: Operations with Functions

308 ANS:

0

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

PTS: 2          REF: 081621aii     TOP: Remainder and Factor Theorems

309 ANS:

$9k^2 - 12ki - 4$

$(3k - 2i)^2 = 9k^2 - 12ki + 4i^2 = 9k^2 - 12ki - 4$

PTS: 2          REF: 081702aii     TOP: Operations with Complex Numbers

310 ANS:

$ac(bd)^x$

PTS: 2          REF: 011710aii     TOP: Operations with Functions

311 ANS:

proportion $\approx .16$; margin of error $\approx .02$

$$\frac{212}{1334} \approx .16 \quad ME = \left( z\sqrt{\frac{p(1-p)}{n}} \right) = \left( 1.96\sqrt{\frac{(0.16)(0.84)}{1334}} \right) \approx 0.02 \text{ or } \frac{1}{\sqrt{1334}} \approx .027$$

PTS: 2      REF: 081716aii      TOP: Analysis of Data

312 ANS:

48



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

PTS: 2      REF: 061609aii      TOP: Normal Distributions
KEY: percent

313 ANS:

$$x^2 + 2x + 4 + \frac{6}{x-2}$$

$$
\require{enclose}
\begin{array}{r}
x^2 + 2x + 4 \phantom{000} \\
x-2 \enclose{longdiv}{x^3 - 0x^2 + 0x - 2} \\
\underline{x^3 - 2x^2} \phantom{0000000} \\
2x^2 + 0x \phantom{000} \\
\underline{2x^2 - 4x} \phantom{000} \\
4x - 2 \\
\underline{4x - 8} \\
6
\end{array}
$$

PTS: 2      REF: 082217aii      TOP: Rational Expressions
KEY: division

314 ANS:

$x(x-1)$

$u = x+2 \qquad u^2 - 5u + 6$

$\qquad\qquad (u-3)(u-2)$

$\qquad\quad (x+2-3)(x+2-2)$

$\qquad\qquad (x-1)x$

PTS: 2      REF: 012301aii      TOP: Factoring Polynomials
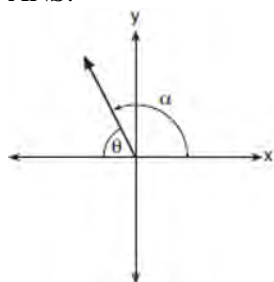KEY: higher power

315 ANS:

$1 + \dfrac{9}{x^2 + 3}$

$\dfrac{x^2 + 12}{x^2 + 3} = \dfrac{x^2 + 3}{x^2 + 3} + \dfrac{9}{x^2 + 3} = 1 + \dfrac{9}{x^2 + 3}$

PTS: 2    REF: 062218aii    TOP: Addition and Subtraction of Rationals

316 ANS:



PTS: 2    REF: 081707aii    TOP: Reference Angles
KEY: bimodalgraph

317 ANS:
$(3, -1, 0)$

$2x + 4y - 2z = 2$   $-x - 3y + 2z = 0$   $x + y = 2$   $3 + 2y - z = 1$   $2y - z = -2$

$\underline{-x - 3y + 2z = 0}$   $\underline{4x - 8y + 2z = 20}$   $\underline{x - y = 4}$   $6 - 4y + z = 10$   $\underline{2(-1) - z = -2}$

$\quad x + y = 2$   $\quad 5x - 5y = 20$   $\quad 2x = 6$   $\quad 2y - z = -2$   $\quad z = 0$

$\quad\quad\quad x - y = 4$   $\quad\quad x = 3$   $\underline{-4y + z = 4}$

$\quad\quad\quad\quad\quad -2y = 2$

$\quad\quad\quad\quad\quad y = -1$

PTS: 2    REF: 062208aii    TOP: Solving Linear Systems
KEY: three variables

318 ANS:
$885.76

$M = \dfrac{45000\left(\dfrac{6.75\%}{12}\right)\left(1 + \dfrac{6.75\%}{12}\right)^{5 \times 12}}{\left(1 + \dfrac{6.75\%}{12}\right)^{5 \times 12} - 1} \approx 885.76$

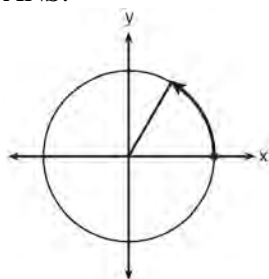PTS: 2    REF: 082316aii    TOP: Evaluating Exponential Expressions

319 ANS:
$R(n) = 1200(1.002)^n - 100n$

PTS: 2    REF: 012002aii    TOP: Operations with Functions

320 ANS:



PTS: 2    REF: 081616aii    TOP: Unit Circle    KEY: bimodalgraph

321 ANS:

0

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

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

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

PTS: 2    REF: 062322aii    TOP: Polynomial Identities

322 ANS:

2450

$$\log_{0.8}\left(\frac{V}{17000}\right) = t \qquad \frac{17,000(0.8)^3 - 17,000(0.8)^1}{3 - 1} \approx -2450$$

$$0.8^t = \frac{V}{17000}$$

$$V = 17000(0.8)^t$$

PTS: 2    REF: 081709aii    TOP: Rate of Change
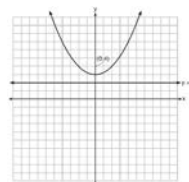KEY: logarithmic

323 ANS:

$$f(x) = 35,000(1.0027)^{12x}$$

$$1.0325^{\frac{1}{12}} \approx 1.0027$$

PTS: 2    REF: 012323aii    TOP: Modeling Exponential Functions

324 ANS:

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

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: $x^2 + y^2 - 8y + 16 = y^2 - 4y + 4$

$$x^2 + 16 = 4y + 4$$
$$\frac{x^2}{4} + 3 = y$$

PTS: 2          REF: spr1502aii     TOP: Graphing Quadratic Functions

325 ANS:
$$\frac{3}{2}$$

$$\sqrt{(-2)^2 + (-3)^2} = \sqrt{13}; \ \tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\dfrac{-3}{\sqrt{13}}}{\dfrac{-2}{\sqrt{13}}} = \frac{3}{2}$$

PTS: 2          REF: 062304aii     TOP: Determining Trigonometric Functions
KEY: extension to reals

326 ANS:
I, II, and III

PTS: 2          REF: 061716aii     TOP: Radicals and Rational Exponents
KEY: variables

327 ANS:
$-0.18x^3 - 6.02x^2 + 91.4x - 180$
$95.4x - 6x^2 - (0.18x^3 + 0.02x^2 + 4x + 180)$

PTS: 2          REF: 082322aii          TOP: Operations with Functions

328 ANS:
$(k+2)(k-2)(k+6)(k+2)$
$k^4 - 4k^2 + 8k^3 - 32k + 12k^2 - 48$

$k^2(k^2 - 4) + 8k(k^2 - 4) + 12(k^2 - 4)$

$(k^2 - 4)(k^2 + 8k + 12)$

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

PTS: 2          REF: fall1505aii          TOP: Factoring Polynomials
KEY: factoring by grouping

329 ANS:
$-0.26$

$$\frac{f(7) - f(-7)}{7 - -7} = \frac{= 2^{-0.25(7)} \bullet \sin\left(\frac{\pi}{2}(7)\right) - 2^{-0.25(-7)} \bullet \sin\left(\frac{\pi}{2}(-7)\right)}{14} \approx -0.26$$

PTS: 2          REF: 061721aii          TOP: Rate of Change
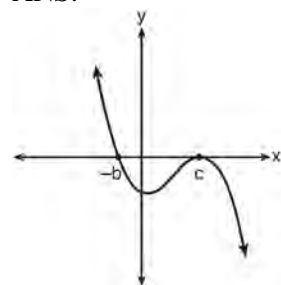KEY: trigonometric

330 ANS:
$\dfrac{-2}{\sqrt{21}}$

$\dfrac{-2}{\sqrt{5^2 - 2^2}} = \dfrac{-2}{\sqrt{21}}$

PTS: 2          REF: 082312aii          TOP: Determining Trigonometric Functions

331 ANS:



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.
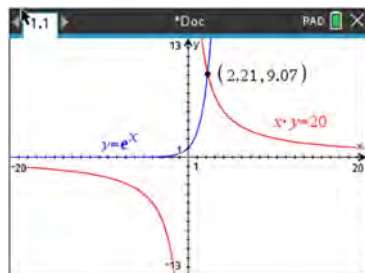
PTS: 2          REF: spr1501aii          TOP: Graphing Polynomial Functions
KEY: bimodalgraph

332 ANS:
1



PTS: 2 REF: 082210aii TOP: Other Systems
KEY: rational

333 ANS:
*B* and *D*
The maximum volume of $p(x) = -(x + 2)(x - 10)(x - 14)$ is about 56, at $x = 12.1$

PTS: 2 REF: 081712aii TOP: Graphing Polynomial Functions

334 ANS:
$\dfrac{\pi}{3}$ left

PTS: 2 REF: 011701aii TOP: Graphing Trigonometric Functions

335 ANS:
2 or $-4$
$x^2 + 2x - 8 = 0$
$(x + 4)(x - 2) = 0$
$\qquad x = -4, 2$

PTS: 2 REF: 081701aii TOP: Undefined Rationals

336 ANS:
18%
$45\% + 31\% - 58\% = 18\%$

PTS: 2 REF: 082307aii TOP: Addition Rule

337 ANS:
$\{-6\}$
$\dfrac{(x + 3)(x + 2)}{(x - 5)(x + 2)} + \dfrac{6(x - 5)}{(x + 2)(x - 5)} = \dfrac{6 + 10x}{(x - 5)(x + 2)}$ 5 is extraneous.

$\qquad x^2 + 5x + 6 + 6x - 30 = 10x + 6$
$\qquad x^2 + x - 30 = 0$
$\qquad (x + 6)(x - 5) = 0$
$\qquad x = -6, 5$

PTS: 2 REF: 062319aii TOP: Solving Rationals

338 ANS:
$f(n) = -8.75 + 0.75n$

PTS: 2      REF: 061720aii      TOP: Sequences      KEY: function notation

339 ANS:
3

$$(6 - ki)^2 = 27 - 36i$$

$$36 - 12ki + k^2 i^2 = 27 - 36i$$

$$9 - k^2 - 12ki = -36i$$

Set real part equal to real part: $9 - k^2 = 0$    Set imaginary part equal to imaginary part: $-12ki = -36i$

$$k = \pm 3 \qquad\qquad \frac{-12ki}{-12i} = \frac{-36i}{-12i}$$

$$k = 3$$

PTS: 2      REF: 012308aii      TOP: Operations with Complex Numbers

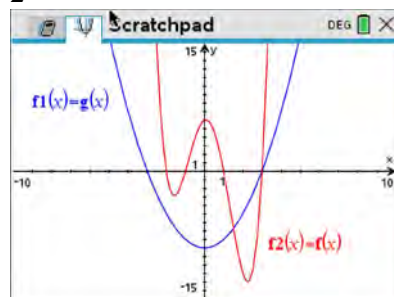340 ANS:
$\dfrac{157}{229}$

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

PTS: 2      REF: 081607aii      TOP: Conditional Probability

341 ANS:
2



PTS: 2      REF: 082319aii      TOP: Other Systems
KEY: polynomial

342 ANS:
$P_0 = 19,378,000$

$P_t = 1.015 P_{t-1}$

PTS: 2      REF: 081624aii      TOP: Sequences      KEY: recursive

343 ANS:
2,125,760

$8r^3 = 216$  $S_{12} = \dfrac{8 - 8(3)^{12}}{1 - 3} = 2125760$

$r^3 = 27$

$r = 3$

PTS: 2    REF: 081902aii    TOP: Series    KEY: geometric

344 ANS:
$\dfrac{1}{21}$

$\dfrac{1}{3} + \dfrac{1}{7} - \dfrac{9}{21} = \dfrac{7}{21} + \dfrac{3}{21} - \dfrac{9}{21} = \dfrac{1}{21}$

PTS: 2    REF: 082410aii    TOP: Addition Rule