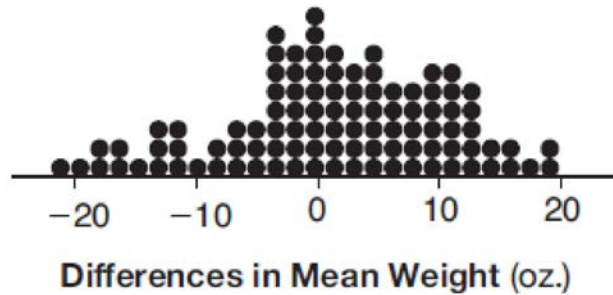


Algebra II Common Core State Standards Regents Bimodal Worksheets

- The expression $6xi^3(-4xi + 5)$ is equivalent to
- The function $f(x) = \frac{x-3}{x^2+2x-8}$ is undefined when x equals
- The completely factored form of $2d^4 + 6d^3 - 18d^2 - 54d$ is
- If $p(x) = ab^x$ and $r(x) = cd^x$, then $p(x) \bullet r(x)$ equals
- Given that $\sin^2 \theta + \cos^2 \theta = 1$ and $\sin \theta = -\frac{\sqrt{2}}{5}$, what is a possible value of $\cos \theta$?
- The zeros for $f(x) = x^4 - 4x^3 - 9x^2 + 36x$ are
- If $\sin^2(32^\circ) + \cos^2(M) = 1$, then M equals
- 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?
- 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.]
- The expression $\frac{6x^3 + 17x^2 + 10x + 2}{2x + 3}$ equals
- 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?
- Which diagram represents an angle, α , measuring $\frac{13\pi}{20}$ radians drawn in standard position, and its reference angle, θ ?

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



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

- 14 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
- 15 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?
- 16 A parabola has its focus at $(1,2)$ and its directrix is $y = -2$. The equation of this parabola could be
- 17 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 $(a^2 + b^2)^2 = (a^2 - b^2)^2 + (2ab)^2$
- 18 Given i is the imaginary unit, $(2 - yi)^2$ in simplest form is

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

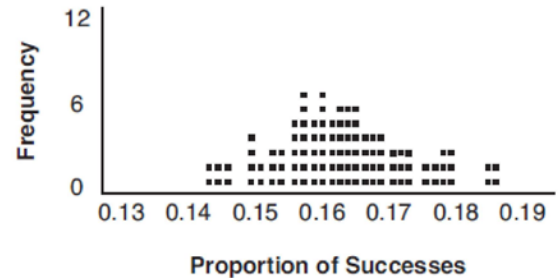
Age Group	Text Messages per Month		
	0–10	11–50	Over 50
15–18	4	37	68
19–22	6	25	87
23–60	25	47	157

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

- 20 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
- 21 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?
- 22 Which graph represents a cosine function with no horizontal shift, an amplitude of 2, and a period of $\frac{2\pi}{3}$?

- 23 Which equation has $1 - i$ as a solution?

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

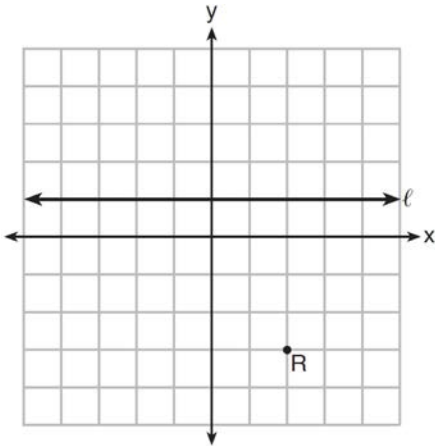


At a 95% confidence level, the proportion of New York City residents with hypertension and the margin of error are closest to

- 25 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?
- 26 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

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

28 Which equation represents the set of points equidistant from line ℓ and point R shown on the graph below?



29 Which statement(s) about statistical studies is true?

- I. A survey of all English classes in a high school would be a good sample to determine the number of hours students throughout the school spend studying.
- II. A survey of all ninth graders in a high school would be a good sample to determine the number of student parking spaces needed at that high school.
- III. A survey of all students in one lunch period in a high school would be a good sample to determine the number of hours adults spend on social media websites.
- IV. A survey of all Calculus students in a high school would be a good sample to determine the number of students throughout the school who don't like math.

30 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?

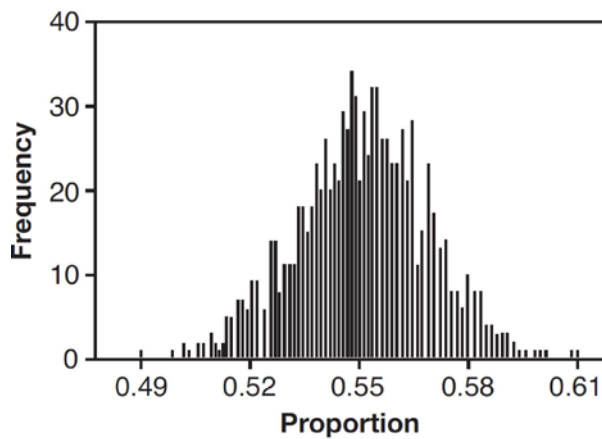
31 The function $p(t) = 110e^{0.03922t}$ models the population of a city, in millions, t years after 2010. As of today, consider the following two statements:
 I. The current population is 110 million.
 II. The population increases continuously by approximately 3.9% per year.
 This model supports

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

33 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.

34 A recursive formula for the sequence 18,9,4.5,... is

35 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

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

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

38 Factored completely, $m^5 + m^3 - 6m$ is equivalent to

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

40 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?

41 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?

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

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

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

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

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

47 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?

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

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

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

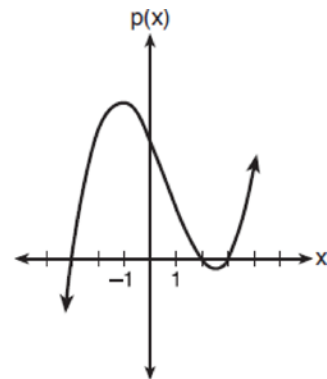
49 A solution of the equation $2x^2 + 3x + 2 = 0$ is

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

51 What is the solution set of the equation

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

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



Which equation could represent $p(x)$?

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

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

55 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

- 56 The loudness of sound is measured in units called decibels (dB). These units are measured by first assigning an intensity I_0 to a very soft sound that is called the threshold sound. The sound to be measured is assigned an intensity, I , and the decibel rating, d , of this sound is found using $d = 10 \log \frac{I}{I_0}$. The threshold sound audible to the average person is 1.0×10^{-12} W/m² (watts per square meter). Consider the following sound level classifications:

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

How would a sound with intensity 6.3×10^{-3} W/m² be classified?

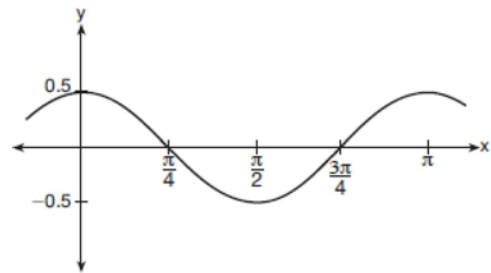
- 57 Which expression is equivalent to $\frac{4x^3 + 9x - 5}{2x - 1}$, where $x \neq \frac{1}{2}$?
- 58 The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height, H , in feet, above the ground of one of the six-person cars can be modeled by $H(t) = 70 \sin\left(\frac{2\pi}{7}(t - 1.75)\right) + 80$, where t is time, in minutes. Using $H(t)$ for one full rotation, this car's minimum height, in feet, is
- 59 Which diagram shows an angle rotation of 1 radian on the unit circle?
- 60 What is the inverse of the function $y = \log_3 x$?
- 61 The solution set for the equation $\sqrt{x + 14} - \sqrt{2x + 5} = 1$ is
- 62 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?
- 63 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?

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

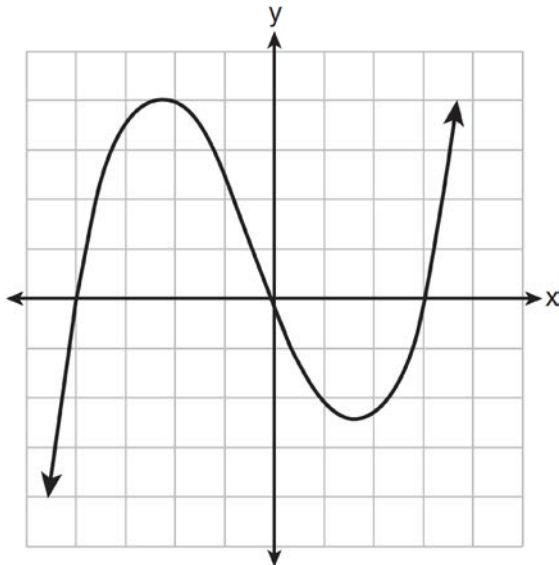
68 The expression $\frac{x^3 + 2x^2 + x + 6}{x + 2}$ is equivalent to

65 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.

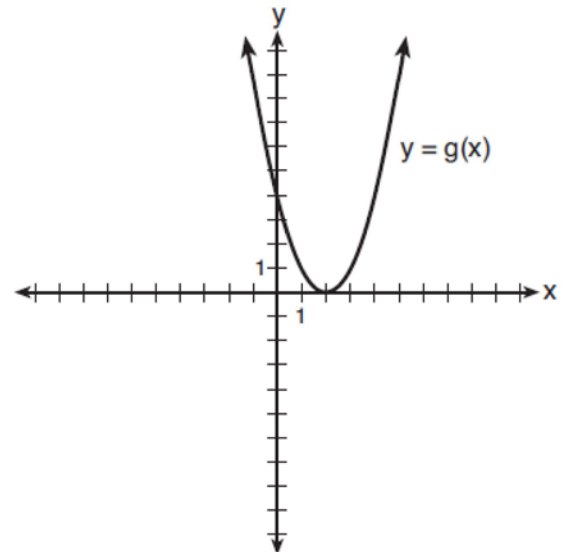
69 Which equation is represented by the graph shown below?



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



70 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?



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

67 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?

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

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

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

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

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

- 74 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?

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

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

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

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

- 79 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?

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

- 81 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?

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

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

$$\log_{0.8}\left(\frac{V}{1700}\right) = t.$$

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*?

- 84 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

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

Algebra II Common Core State Standards Regents Bimodal Worksheets Answer Section

1 ANS:

$$-24x^2 - 30xi$$

$$6xi^3(-4xi + 5) = -24x^2i^4 + 30xi^3 = -24x^2(1) + 30x(-1) = -24x^2 - 30xi$$

PTS: 2

REF: 061704aai

TOP: Operations with Complex Numbers

2 ANS:

2 or -4

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

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

$$x = -4, 2$$

PTS: 2

REF: 081701aai

TOP: Undefined Rationals

3 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: 081615aai

TOP: Factoring Polynomials

KEY: factoring by grouping

4 ANS:

$$ac(bd)^x$$

PTS: 2

REF: 011710aai

TOP: Operations with Functions

5 ANS:

$$\frac{\sqrt{23}}{5}$$

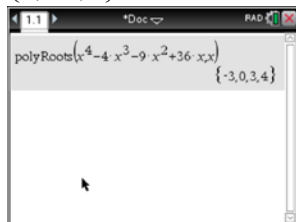
$$\cos \theta = \pm \sqrt{1 - \left(\frac{-\sqrt{2}}{5}\right)^2} = \pm \sqrt{\frac{25}{25} - \frac{2}{25}} = \pm \frac{\sqrt{23}}{5}$$

PTS: 2

REF: 061712aai

TOP: Determining Trigonometric Functions

6 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: 061606aai TOP: Zeros of Polynomials
 KEY: AII

7 ANS:
 32°

PTS: 2 REF: 011704aai TOP: Simplifying Trigonometric Expressions

8 ANS:
 left a units, down b units

PTS: 2 REF: 061706aai TOP: Graphing Trigonometric Functions

9 ANS:

$$(1.00427)^m$$

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

PTS: 2 REF: 061621aai TOP: Modeling Exponential Functions
 KEY: AII

10 ANS:

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

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

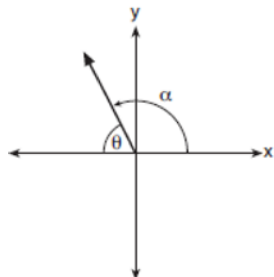
PTS: 2 REF: fall1503aai TOP: Rational Expressions

11 ANS:

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

PTS: 2 REF: 061602aai TOP: Modeling Rationals

12 ANS:



PTS: 2 REF: 081707aai TOP: Reference Angles

13 ANS:

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

PTS: 2 REF: 011709aai TOP: Analysis of Data

14 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: 061714aai TOP: Theoretical Probability

15 ANS:

$$P_0 = 19,378,000$$

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

PTS: 2 REF: 081624aai TOP: Sequences

16 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: 061717aai TOP: Graphing Quadratic Functions

17 ANS:

I and III

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

PTS: 2 REF: 081620aai TOP: Polynomial Identities

18 ANS:

$$-y^2 - 4yi + 4$$

$$(2 - yi)(2 - yi) = 4 - 4yi + y^2 i^2 = -y^2 - 4yi + 4$$

PTS: 2

REF: 061603aii

TOP: Operations with Complex Numbers

19 ANS:

$$\frac{157}{229}$$

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

PTS: 2

REF: 081607aii

TOP: Conditional Probability

20 ANS:

$$B(t) = 750(1.012)^{12t}$$

$$B(t) = 750 \left(1.16^{\frac{1}{12}} \right)^{12t} \approx 750(1.012)^{12t} \quad B(t) = 750 \left(1 + \frac{0.16}{12} \right)^{12t} \text{ is wrong, because the growth is an annual rate}$$

that is not compounded monthly.

PTS: 2

REF: spr1504aii

TOP: Modeling Exponential Functions

KEY: All

21 ANS:

149

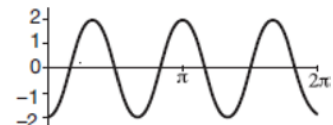
$$d = 32(.8)^{b-1} \quad S_n = \frac{32 - 32(.8)^{12}}{1 - .8} \approx 149$$

PTS: 2

REF: 081721aii

TOP: Series

22 ANS:

(3) repeats 3 times over 2π .

PTS: 2

REF: 011722aii

TOP: Graphing Trigonometric Functions

KEY: recognize

23 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

24 ANS:

proportion $\approx .16$; margin of error $\approx .02$

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

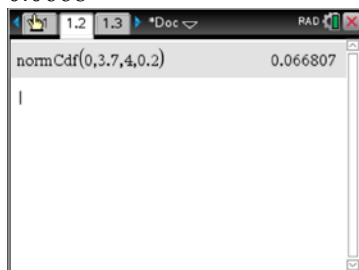
PTS: 2

REF: 081716aai

TOP: Analysis of Data

25 ANS:

0.0668



PTS: 2

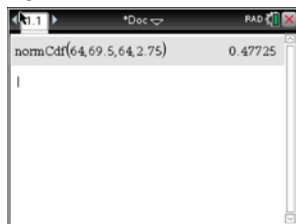
REF: 081711aai

TOP: Normal Distributions

KEY: percent

26 ANS:

48


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

PTS: 2

REF: 061609aai

TOP: Normal Distributions

KEY: percent

27 ANS:

 $\frac{\pi}{3}$ left

PTS: 2

REF: 011701aai

TOP: Graphing Trigonometric Functions

28 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

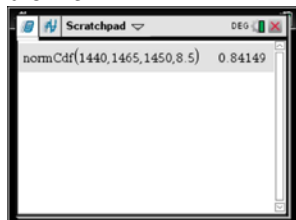
REF: 081619aai

TOP: Graphing Quadratic Functions

- 29 ANS:
I, only
II. Ninth graders drive to school less often; III. Students know little about adults; IV. Calculus students love math!

PTS: 2 REF: 081602aai TOP: Analysis of Data
KEY: bias

- 30 ANS:
0.8415



PTS: 2 REF: 081604aai TOP: Normal Distributions
KEY: probability

- 31 ANS:
II, only
The 2010 population is 110 million.

PTS: 2 REF: 061718aai TOP: Modeling Exponential Functions

- 32 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: 061709aai TOP: Operations with Functions

- 33 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: 081712aai TOP: Graphing Polynomial Functions

- 34 ANS:
 $g_1 = 18$
 $g_n = \frac{1}{2}g_{n-1}$
(2) is not recursive

PTS: 2 REF: 081608aai TOP: Sequences

35 ANS:
0.03

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

PTS: 2 REF: 081612aai TOP: Analysis of Data

36 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: fall1505aai TOP: Factoring Polynomials

KEY: factoring by grouping

37 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: 061707aai TOP: Solving Quadratics

KEY: complex solutions | taking square roots

38 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 REF: 011703aai TOP: Factoring Polynomials

KEY: higher power AII

39 ANS:

$$f(n) = -8.75 + 0.75n$$

PTS: 2 REF: 061720aai TOP: Sequences KEY: AII

40 ANS:

$$j_1 = 250,000$$

$$j_n = 1.00375j_{n-1}$$

PTS: 2 REF: 061623aai TOP: Sequences

41 ANS:

$$a_0 = 1000$$

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

PTS: 2 REF: 081724aai TOP: Sequences

42 ANS:

$$-1 + 2i \text{ and } -1 - 2i$$

$$x^2 + 2x + 1 = -5 + 1$$

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

$$x + 1 = \pm 2i$$

$$x = -1 \pm 2i$$

PTS: 2 REF: 081703aai TOP: Solving Quadratics

KEY: complex solutions | completing the square

43 ANS:

$$a_n = 2 \cdot 3^n$$

PTS: 2 REF: 081618aai TOP: Sequences

44 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: 061702aai TOP: Exponential Equations

KEY: without common base

45 ANS:

$$2, -2, i, \text{ and } -i$$

PTS: 2 REF: 081708aai TOP: Zeros of Polynomials

KEY: All

46 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. $y = \frac{-1}{4p}(x-h)^2 + k$

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

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

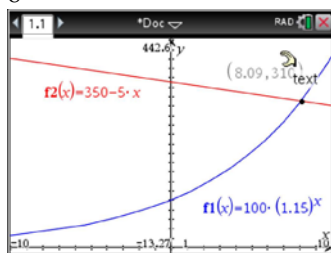
PTS: 2

REF: 081706aai

TOP: Graphing Quadratic Functions

47 ANS:

8



PTS: 2

REF: 011716aai

TOP: Other Systems

KEY: All

48 ANS:

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

$$\left(\frac{1}{2}\right)^{\frac{1}{73.83}} \approx 0.990656$$

PTS: 2

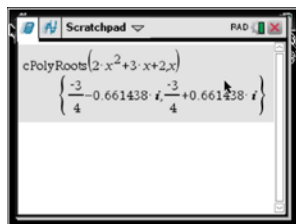
REF: 081710aai

TOP: Modeling Exponential Functions

KEY: All

49 ANS:

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



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

PTS: 2

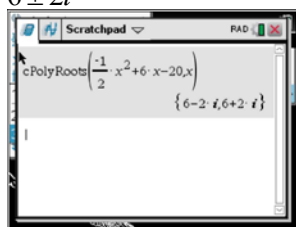
REF: 061612aai

TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

50 ANS:

$6 \pm 2i$



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

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

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

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

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

$$x = 6 \pm 2i$$

PTS: 2

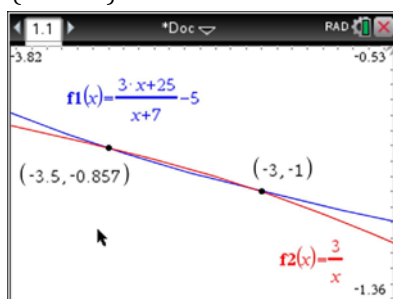
REF: fall1504aii

TOP: Solving Quadratics

KEY: complex solutions | completing the square

51 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

52 ANS:

$$p(x) = (x^2 - 9)(x - 2)$$

PTS: 2

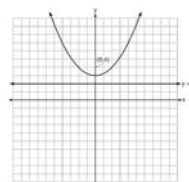
REF: 061701aii

TOP: Zeros of Polynomials

KEY: AII

53 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

54 ANS:

$$2x^2 - 3x + 7 - \frac{11}{2x+3}$$

$$2x+3 \overline{) 4x^3 + 0x^2 + 5x + 10}$$

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

$$-6x^2 + 5x$$

$$\underline{-6x^2 - 9x}$$

$$14x + 10$$

$$\underline{14x + 21}$$

$$-11$$

PTS: 2 REF: 061614aai TOP: Rational Expressions

55 ANS:

$$P = 714(0.9716)^y$$

$$0.75^{\frac{1}{10}} \approx 0.9716$$

PTS: 2 REF: 061713aai TOP: Modeling Exponential Functions
KEY: All

56 ANS:

very loud

$$d = 10 \log \frac{6.3 \times 10^{-3}}{1.0 \times 10^{-12}} \approx 98$$

PTS: 2 REF: 011715aai TOP: Evaluating Logarithmic Expressions

57 ANS:

$$2x^2 + x + 5$$

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

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

$$2x^2 + 9x$$

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

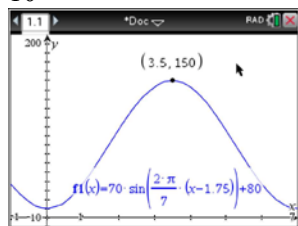
$$10x - 5$$

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

PTS: 2 REF: 081713aai TOP: Rational Expressions

58 ANS:

10



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

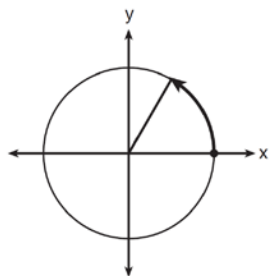
PTS: 2

REF: 061613aai

TOP: Graphing Trigonometric Functions

KEY: maximum/minimum

59 ANS:



PTS: 2

REF: 081616aai

TOP: Unit Circle

60 ANS:

$$y = 3^x$$

PTS: 2

REF: 011708aai

TOP: Inverse of Functions

KEY: equations

61 ANS:

{2}

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

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

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

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

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

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

$$x = 2, 22$$

PTS: 2

REF: 081704aai

TOP: Solving Radicals

KEY: advanced

62 ANS:
 $V = 120 \sin(120\pi t)$

$$\text{period} = \frac{2\pi}{B}$$

$$\frac{1}{60} = \frac{2\pi}{B}$$

$$B = 120\pi$$

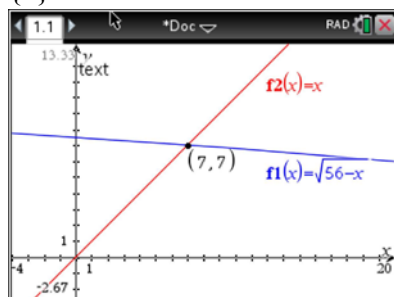
PTS: 2 REF: 061624aai TOP: Modeling Trigonometric Functions

63 ANS:
 $300(1.30)^{\frac{365}{14}}$

PTS: 2 REF: 081622aai TOP: Modeling Exponential Functions

KEY: All

64 ANS:
 $\{7\}$



$$\sqrt{56-x} = x \quad -8 \text{ is extraneous.}$$

$$56-x = x^2$$

$$0 = x^2 + x - 56$$

$$0 = (x+8)(x-7)$$

$$x = 7$$

PTS: 2 REF: 061605aai TOP: Solving Radicals

KEY: extraneous solutions

65 ANS:
 $C(n) = \frac{329.99 + 108.78n}{n}$

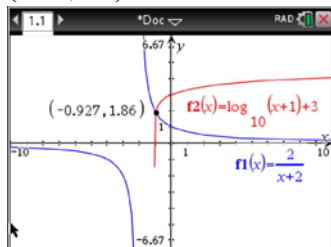
PTS: 2 REF: 061722aai TOP: Modeling Rationals

66 ANS:
 0

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

PTS: 2 REF: 081621aai TOP: Remainder Theorem

67 ANS:
 (-0.9, 1.9)



PTS: 2 REF: 011712aai TOP: Other Systems
 KEY: All

68 ANS:

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

$$x+2 \overline{) \begin{array}{r} x^2 + 0x + 1 \\ x^3 + 2x^2 + x + 6 \\ \underline{x^3 + 2x^2} \\ 0x^2 + x \\ \underline{0x^2 + 0x} \\ x + 6 \\ \underline{x + 2} \\ 4 \end{array}}$$

PTS: 2 REF: 081611aai TOP: Rational Expressions

69 ANS:

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

PTS: 2 REF: 061708aai TOP: Graphing Trigonometric Functions
 KEY: identify

70 ANS:

{(1, 1), (6, 16)}

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

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

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

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

$$x = 6, 1$$

PTS: 2 REF: 011705aai TOP: Quadratic-Linear Systems
 KEY: All

71 ANS:
I, II, and III

PTS: 2 REF: 061716aai TOP: Radicals and Rational Exponents
KEY: variables

72 ANS:

$$-1$$

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

$$2x - 8 + 3x + 9 = 2x - 2$$

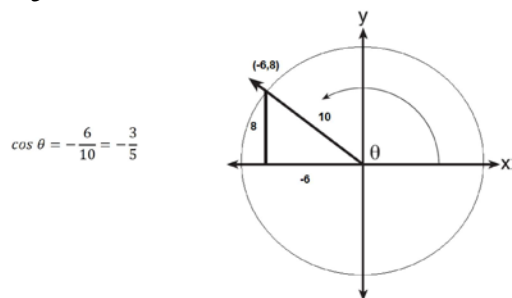
$$3x = -3$$

$$x = -1$$

PTS: 2 REF: 011717aai TOP: Solving Rationals
KEY: rational solutions

73 ANS:

$$-\frac{3}{5}$$



PTS: 2 REF: 061617aai TOP: Determining Trigonometric Functions
KEY: extension to reals

74 ANS:

56

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

PTS: 2 REF: 011702aai TOP: Modeling Exponential Functions
KEY: All

75 ANS:

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

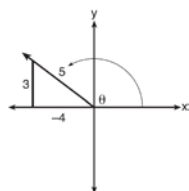
$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(6)(29)}}{2(6)} = \frac{8 \pm \sqrt{-632}}{12} = \frac{8 \pm i\sqrt{4}\sqrt{158}}{12} = \frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$$

PTS: 2 REF: 011711aai TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

76 ANS:

$$\frac{3}{5}$$

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

77 ANS:

2.6



PTS: 2

REF: 081603aii

TOP: Other Systems

KEY: All

78 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

79 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

KEY: All

80 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: 081714aai TOP: Inverse of Functions

KEY: equations

81 ANS:

$$496 \pm 230$$

$$496 \pm 2(115)$$

PTS: 2 REF: 011718aai TOP: Normal Distributions

KEY: interval

82 ANS:

$$-0.26$$

$$\frac{f(7) - f(-7)}{7 - (-7)} = \frac{2^{-0.25(7)} \cdot \sin\left(\frac{\pi}{2}(7)\right) - 2^{-0.25(-7)} \cdot \sin\left(\frac{\pi}{2}(-7)\right)}{14} \approx -0.26$$

PTS: 2 REF: 061721aai TOP: Rate of Change

KEY: All

83 ANS:

$$2450$$

$$\log_{0.8}\left(\frac{V}{1700}\right) = t \quad \frac{17,000(0.8)^3 - 17,000(0.8)^1}{3-1} \approx -2450$$

$$0.8^t = \frac{V}{17000}$$

$$V = 17000(0.8)^t$$

PTS: 2 REF: 081709aai TOP: Rate of Change

KEY: All

84 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

85 ANS:

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

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

$$-4x = 3y - 8$$

$$-4x + 8 = 3y$$

$$-\frac{4}{3}x + \frac{8}{3} = y$$

PTS: 2

REF: 061616aii

TOP: Inverse of Functions

KEY: equations