JMAP
REGENTS BY STATE STANDARD: TOPIC

NY Algebra II Regents Exam Questions from Spring 2015 to January 2025 Sorted by State Standard: Topic

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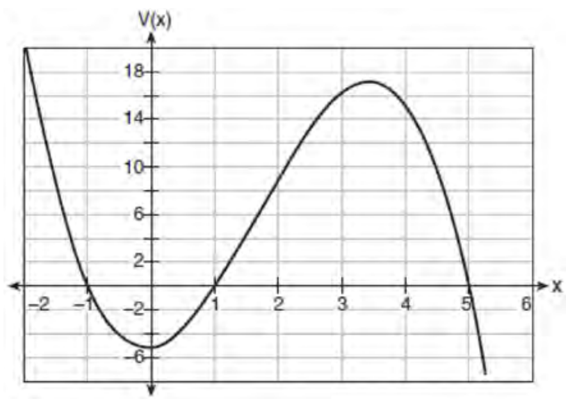
Algebra II Regents Exam Questions by State Standard: Topic

RATE

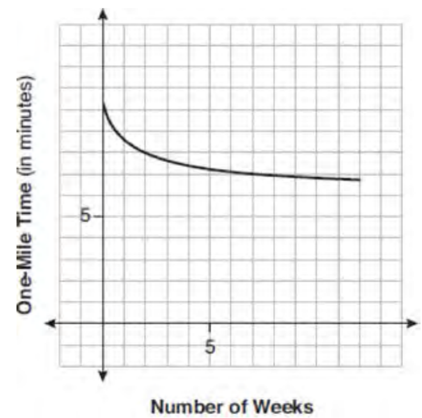
F.IF.B.6: RATE OF CHANGE

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



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

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



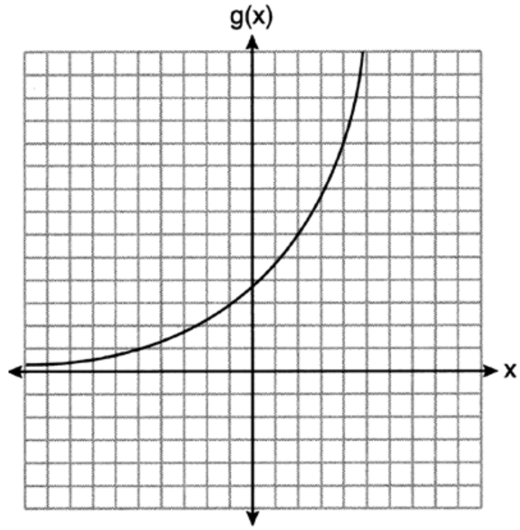
Which statement regarding Irma's one-mile training program is correct?
1 Her one-mile speed increased as the number of weeks increased.
2 Her one-mile speed decreased as the number of weeks increased.
3 If the trend continues, she will run under a six-minute mile by week thirteen.
4 She reduced her one-mile time the most between weeks ten and twelve.

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

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

Over which period of time was the average rate of change in population the greatest?
1 1850 to 1910
2 1990 to 2010
3 1950 to 1970
4 1890 to 1970

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



x	t(x)
−1	3
0	5
1	2
2	−5
3	−1
4	3

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

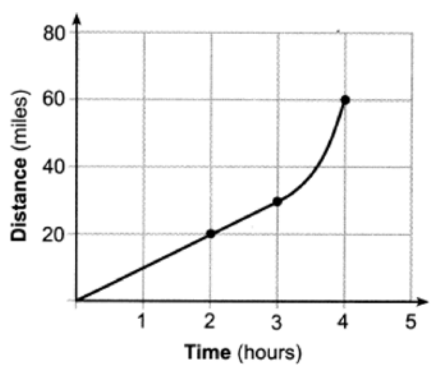
1 g has a greater average rate of change.

2 The average rates of change are equal.

3 The average rate of change for g is twice the average rate of change for t.

4 The average rate of change for g is half the average rate of change for t.

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



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

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

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

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

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

Over which interval of time is her average rate of change for the balance on her credit card account the greatest?
1 month 10 to month 60
2 month 19 to month 69
3 month 36 to month 72
4 month 60 to month 73

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

9 The function $N(t) = 100e^{-0.023t}$ models the number of grams in a sample of cesium-137 that remain after t years. On which interval is the sample's average rate of decay the fastest?
1 $[1, 10]$
2 $[10, 20]$
3 $[15, 25]$
4 $[1, 30]$

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

11 The value of a new car depreciates over time. Greg purchased a new car in June 2011. The value, V, of his car after t years can be modeled by the equation $\log_{0.8}\left(\frac{V}{17000}\right) = t$. What is the average decreasing rate of change per year of the value of the car from June 2012 to June 2014, to the *nearest ten dollars per year*?
1 1960
2 2180
3 2450
4 2770

12 Which function has a greater average rate of change on the interval $[-1,4]$? Justify your answer.

x	**m(x)**
–2	–3
–1	1
0	1
1	3
2	13
3	37
4	81
5	151

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

13 The population of China, in millions, can be modeled by the function $P(x) = 316.93e^{0.0133x}$, where x is the number of years since 1900. The population of India since 1900 is summarized in the table below:

Years since 1900	**Population** (millions)
0	243
10	254
20	268
30	285
40	324
50	376.3
60	450.6
70	555.1
80	699
60	873.3
100	1056.6
110	1234.3
120	1380

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

14 Which function shown below has a greater average rate of change on the interval $[-2,4]$? Justify your answer.

x	f(x)
–4	0.3125
–3	0.625
–2	1.25
–1	2.5
0	5
1	10
2	20
3	40
4	80
5	160
6	320

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

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

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

17 An initial investment of \$1000 reaches a value, $V(t)$, according to the model $V(t) = 1000(1.01)^{4t}$, where t is the time in years. Determine the average rate of change, to the *nearest dollar per year*, of this investment from year 2 to year 7.

18 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200,000(l.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles, from 2010 to 2018 to the *nearest dollar per year*. Explain what this rate of change means as it relates to median house prices.

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

1 –3.66
2 –0.30
3 –0.26
4 3.36

20 The table below shows the number of hours of daylight on the first day of each month in Rochester, NY.

Month	Hours of Daylight
Jan.	9.4
Feb.	10.6
March	11.9
April	13.9
May	14.7
June	15.4
July	15.1
Aug.	13.9
Sept.	12.5
Oct.	11.1
Nov.	9.7
Dec.	9.0

Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st? Interpret what this means in the context of the problem.

21 The average monthly high temperature in Buffalo, in degrees Fahrenheit, can be modeled by the function $B(t) = 25.29\sin(0.4895t - 1.9752) + 55.2877$, where t is the month number (January = 1). State, to the *nearest tenth*, the average monthly rate of temperature change between August and November. Explain its meaning in the given context.

22 The monthly high temperature (ºF) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1. Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*. Explain what this value represents in the given context.

QUADRATICS

N.CN.A.2: OPERATIONS WITH COMPLEX NUMBERS

23 The expression $3i(ai - 6i^2)$ is equivalent to
1 $3a + 18i$
2 $3a - 18i$
3 $-3a + 18i$
4 $-3a - 18i$

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

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

26 Given that i is the imaginary unit, the expression $(x-2i)^2$ is equivalent to
1 x^2+4
2 x^2-4
3 $x^2-2xi-4$
4 $x^2-4xi-4$

27 Given i is the imaginary unit, $(2-yi)^2$ in simplest form is
1 $y^2-4yi+4$
2 $-y^2-4yi+4$
3 $-y^2+4$
4 y^2+4

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

29 The expression $i^2(5x-2i)^2$ is equivalent to
1 $-25x^2+20xi-4$
2 $-25x^2+20xi+4$
3 $25x^2+20xi+4$
4 $25x^2+4$

30 The expression $6-(3x-2i)^2$ is equivalent to
1 $-9x^2+12xi+10$
2 $9x^2-12xi+2$
3 $-9x^2+10$
4 $-9x^2+12xi-4i+6$

31 Where i is the imaginary unit, the expression $(x+3i)^2-(2x-3i)^2$ is equivalent to
1 $-3x^2$
2 $-3x^2-18$
3 $-3x^2+18xi$
4 $-3x^2-6xi-18$

32 Which expression is equivalent to $(2x-i)^2-(2x-i)(2x+3i)$ where i is the imaginary unit and x is a real number?
1 $-4-8xi$
2 $-4-4xi$
3 2
4 $8x-4i$

33 Expressed in simplest $a+bi$ form, $(7-3i)+(x-2i)^2-(4i+2x^2)$ is
1 $(3-x^2)-(4x+7)i$
2 $(3+3x^2)-(4x+7)i$
3 $(3-x^2)-7i$
4 $(3+3x^2)-7i$

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

35 Given i is the imaginary unit, which expression is equivalent to $5i(2x+3i)-x\sqrt{-9}$?
1 $15+13xi$
2 $-15+13xi$
3 $15+7xi$
4 $-15+7xi$

36 If $(6-ki)^2=27-36i$, the value of k is
1 -36
2 -3
3 3
4 6

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

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

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

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

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

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

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

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

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

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

A.REI.B.4: SOLVING QUADRATICS

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

46 What is the solution when the equation $wx^2+w=0$ is solved for x, where w is a positive integer?
1 -1
2 0
3 6
4 $\pm i$

47 The roots of the equation $x^2+2x+5=0$ are
1 -3 and 1
2 -1, only
3 $-1+2i$ and $-1-2i$
4 $-1+4i$ and $-1-4i$

48 The roots of the equation $0=x^2+6x+10$ in simplest $a+bi$ form are
1 $-3\pm 2i$
2 $-6\pm i$
3 $-3\pm i$
4 $-3\pm i\sqrt{2}$

49 The roots of the equation $x^2-4x=-13$ are
1 $2\pm 3i$
2 $2\pm 6i$
3 $2\pm\sqrt{17}$
4 $2\pm\sqrt{13}$

50 The solutions to the equation $-\frac{1}{2}x^2=-6x+20$ are
1 $-6\pm 2i$
2 $-6\pm 2\sqrt{19}$
3 $6\pm 2i$
4 $6\pm 2\sqrt{19}$

51 A solution of the equation $2x^2+3x+2=0$ is
1 $-\frac{3}{4}+\frac{1}{4}i\sqrt{7}$
2 $-\frac{3}{4}+\frac{1}{4}i$
3 $-\frac{3}{4}+\frac{1}{4}\sqrt{7}$
4 $\frac{1}{2}$

52 The roots of the equation $3x^2+2x=-7$ are
1 $-2,-\frac{1}{3}$
2 $-\frac{7}{3},1$
3 $-\frac{1}{3}\pm\frac{2i\sqrt{5}}{3}$
4 $-\frac{1}{3}\pm\frac{\sqrt{11}}{3}$

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

1 $-\frac{1}{4}, 2$

2 $\frac{7}{8} \pm \frac{\sqrt{79}}{8} i$

3 $\frac{7}{8} \pm \frac{\sqrt{241}}{8}$

4 $\frac{7}{8} \pm \frac{\sqrt{143}}{8} i$

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

1 $\frac{1}{5} \pm \frac{\sqrt{21}}{5}$

2 $\frac{1}{5} \pm \frac{\sqrt{19}}{5} i$

3 $\frac{1}{5} \pm \frac{\sqrt{66}}{5} i$

4 $\frac{1}{5} \pm \frac{\sqrt{66}}{5}$

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

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

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

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

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

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

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

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

3 $1 \pm \frac{\sqrt{12}}{3}$

4 $1 \pm 2\sqrt{6}i$

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

1 $\frac{\sqrt{6}}{5} i$

2 $\frac{\sqrt{6}}{5}$

3 $\frac{1}{5} i$

4 $\frac{1}{5}$

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

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

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

61 a) Algebraically determine the roots, in simplest $a + bi$ form, to the equation below.

$$x^2 - 2x + 7 = 4x - 10$$

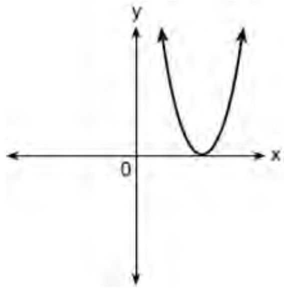
b) Consider the system of equations below.

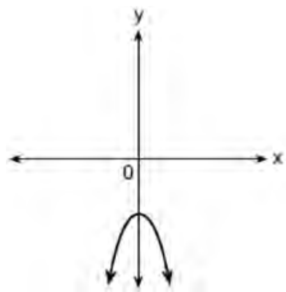
$$y = x^2 - 2x + 7$$
$$y = 4x - 10$$

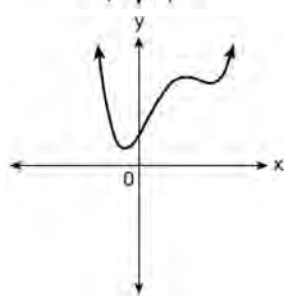
The graph of this system confirms the solution from part a is imaginary. Explain why.

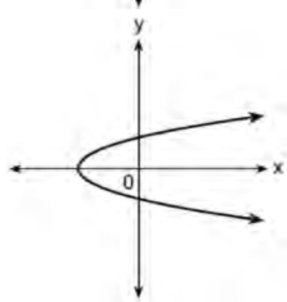
A.REI.B.4: USING THE DISCRIMINANT

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

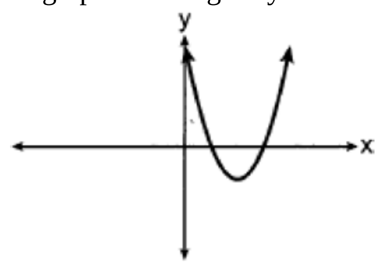
1 

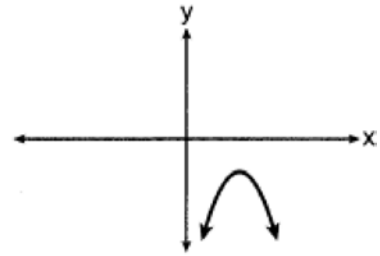
2 

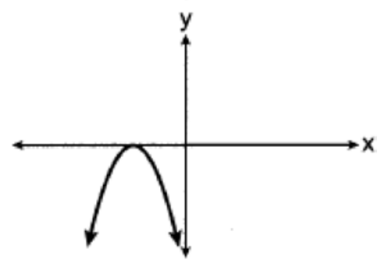
3 

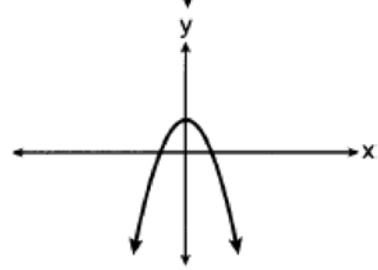
4 

63 Which graph has imaginary roots?

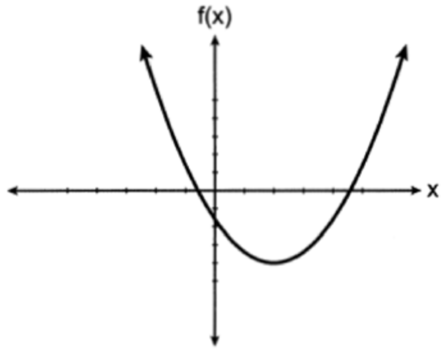
1 

2 

3 

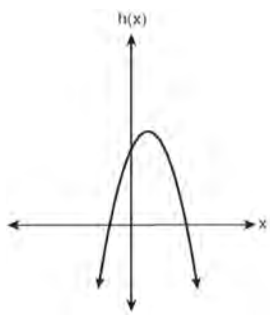
4 

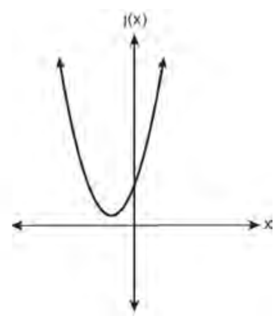
64 If $f(x)$ is represented by the graph below, which translation of $f(x)$ would have imaginary roots?



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

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





Which quadratic functions have imaginary roots?
1 $g(x)$ and $h(x)$
2 $g(x)$ and $j(x)$
3 $f(x)$ and $h(x)$
4 $f(x)$ and $j(x)$

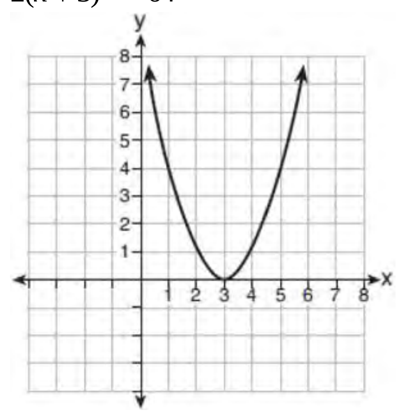
66 Which representation of a quadratic has imaginary roots?

1

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

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

3



4 $2x^2+32=0$

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

A.REI.B.4: COMPLEX CONJUGATE ROOT THEOREM

68 Which equation has roots of $3+i$ and $3-i$?
1 $x^2-6x+10=0$
2 $x^2+6x-10=0$
3 $x^2-10x+6=0$
4 $x^2+10x-6=0$

69 Which equation has $1-i$ as a solution?
1 $x^2+2x-2=0$
2 $x^2+2x+2=0$
3 $x^2-2x-2=0$
4 $x^2-2x+2=0$

G.GPE.A.2: GRAPHING QUADRATIC FUNCTIONS

70 The parabola described by the equation $y = \frac{1}{12}(x-2)^2 + 2$ has the directrix at $y = -1$. The focus of the parabola is
1 $(2,-1)$
2 $(2,2)$
3 $(2,3)$
4 $(2,5)$

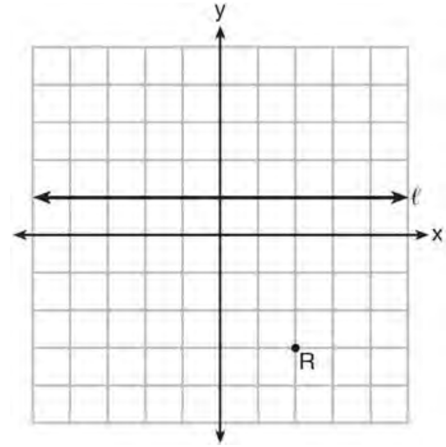
71 What is the focus of the parabola $8(y+2) = (x+5)^2$?
1 $(-5,0)$
2 $(-5,-4)$
3 $(5,0)$
4 $(5,4)$

72 A parabola has a directrix of $y = 3$ and a vertex at $(2,1)$. Which ordered pair is the focus of the parabola?
1 $(2,-1)$
2 $(2,0)$
3 $(2,2)$
4 $(2,5)$

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

74 The parabola with equation $12(y+1) = (x-4)^2$ has
1 a vertex at $(4,2)$
2 a focus at $(4,-1)$
3 a directrix $y = -4$
4 four units between the focus and vertex

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



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

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

77 A parabola has its focus at $(1,2)$ and its directrix is $y = -2$. The equation of this parabola could be
1 $y = 8(x+1)^2$
2 $y = \frac{1}{8}(x+1)^2$
3 $y = 8(x-1)^2$
4 $y = \frac{1}{8}(x-1)^2$

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

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

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

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

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

1 $y = \frac{1}{8}(x+3)^2 - 5$
2 $y = \frac{1}{8}(x-3)^2 + 5$
3 $y = -\frac{1}{8}(x+3)^2 + 5$
4 $y = -\frac{1}{8}(x-3)^2 + 5$

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

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

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

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

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

1 $y^2 = 4(x-5)$
2 $x^2 = 4(y-5)$
3 $y^2 = 8(x-5)$
4 $x^2 = 8(y-6)$

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

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

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

86 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.

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

88 Determine an equation for the parabola with focus $(4,-1)$ and directrix $y = -5$. (Use of the grid below is optional.)

89 Determine an equation for the parabola with focus $(-2,4)$ and directrix $y = 10$. (The use of the grid below is optional.)

POLYNOMIALS

A.SSE.A.2: FACTORING POLYNOMIALS

90 When the expression $(x+2)^2 + 4(x+2) + 3$ is rewritten as the product of two binomials, the result is
1 $(x+3)(x+1)$
2 $(x+5)(x+3)$
3 $(x+2)(x+2)$
4 $(x+6)(x+1)$

91 Which expression is equivalent to $(x+2)^2 - 5(x+2) + 6$?
1 $x(x-1)$
2 $(x-3)(x-2)$
3 $(x-4)(x+3)$
4 $(x-6)(x+1)$

92 Which expression is equivalent to $(x+3)^2 + 4(x+3) - 5$?
1 $(x+5)(x-1)$
2 $(x+8)(x+2)$
3 $(x-2)(x+4)$
4 $x^2 + 4x + 16$

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

94 Which expression is equivalent to $(x-2)^2+27(x-2)-90$?
1 $(x+30)(x-3)$
2 $(x+28)(x-5)$
3 $(x-30)(x+3)$
4 $(x-2)(x+25)(x-90)$

95 The expression $(x^2+3)^2-2(x^2+3)-24$ is equivalent to
1 $(x^2+9)(x^2-1)$
2 $(x^2-3)(x^2+7)$
3 x^4-2x^2-21
4 x^4+4x^2-9

96 If $\left(a^3+27\right)=(a+3)\left(a^2+ma+9\right)$, then m equals
1 –9
2 –3
3 3
4 6

97 When factored completely, m^5+m^3-6m is equivalent to
1 $(m+3)(m-2)$
2 $(m^2+3m)(m^2-2)$
3 $m(m^4+m^2-6)$
4 $m(m^2+3)(m^2-2)$

98 Which expression is equivalent to $x^6y^4(x^4-16)-9(x^4-16)$?
1 $x^{10}y^4-16x^6y^4-9x^4-144$
2 $(x^6y^4-9)(x+2)^3(x-2)$
3 $(x^3y^2+3)(x^3y^2-3)(x+2)^2(x-2)^2$
4 $(x^3y^2+3)(x^3y^2-3)(x^2+4)(x^2-4)$

99 Which expression is *not* equivalent to $36x^6-25y^4$?
1 $6^2(x^3)^2-5^2(y^2)^2$
2 $(6x^3-5y^2)(6x^3+5y^2)$
3 $(6x^6-5y^4)(6x^6+5y^4)$
4 $(3\bullet 2x^3-5y^2)(3\bullet 2x^3+5y^2)$

100 Which expression is equivalent to x^8-y^8?
1 $(x-y)^8$
2 $(x^2+y^2)^2(x^2-y^2)^2$
3 $(x^4+y^4)(x^2+y^2)(x+y)(x-y)$
4 $(x+y)^4(x-y)^4$

101 Factored completely, $x^4+4x^3-9x^2-36x$ is equivalent to
1 $x(x+9)(x-9)(x+4)$
2 $x(x+3)(x-3)(x+4)$
3 $(x^3-9x)(x+4)$
4 $x(x^2-9)(x+4)(x+4)$

102 The completely factored form of $2d^4+6d^3-18d^2-54d$ is
1 $2d(d^2-9)(d+3)$
2 $2d(d^2+9)(d+3)$
3 $2d(d+3)^2(d-3)$
4 $2d(d-3)^2(d+3)$

103 What is the completely factored form of $k^4-4k^2+8k^3-32k+12k^2-48$?
1 $(k-2)(k-2)(k+3)(k+4)$
2 $(k-2)(k-2)(k+6)(k+2)$
3 $(k+2)(k-2)(k+3)(k+4)$
4 $(k+2)(k-2)(k+6)(k+2)$

104 The completely factored form of $n^4-9n^2+4n^3-36n-12n^2+108$ is
1 $(n^2-9)(n+6)(n-2)$
2 $(n+3)(n-3)(n+6)(n-2)$
3 $(n-3)(n-3)(n+6)(n-2)$
4 $(n+3)(n-3)(n-6)(n+2)$

105 Which factorization is *incorrect*?

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

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

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

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

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

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

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

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

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

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

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

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

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

A.APR.B.3: SOLVING POLYNOMIAL EQUATIONS

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

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

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

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

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

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

1 1
2 2
3 -1
4 -2

120 Which statement regarding polynomials and their zeros is true?

1 $f(x) = (x^2-1)(x+a)$ has zeros of 1 and $-a$, only.
2 $f(x) = x^3 - ax^2 + 16x - 16a$ has zeros of 4 and a, only.
3 $f(x) = (x^2+25)(x+a)$ has zeros of ± 5 and $-a$.
4 $f(x) = x^3 - ax^2 - 9x + 9a$ has zeros of ± 3 and a.

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

1 2 and -2, only
2 $2, -2$, and -4
3 -4, i, and $-i$
4 $2, -2, i$, and $-i$

122 Given $f(x) = x^4 + x^3 - 3x^2 + 9x - 108$ and $f(3) = 0$, which values satisfy $f(x) = 0$?
1 $-4, 3$ only
2 $-3, 4$ only
3 $\pm 3i, -4, 3$
4 $\pm 3i, -3, 4$

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

124 What are the zeros of $s(x) = x^4 - 9x^2 + 3x^3 - 27x - 10x^2 + 90$?
1 $\{-3, -2, 5\}$
2 $\{-2, 3, 5\}$
3 $\{-3, -2, 3, 5\}$
4 $\{-5, -3, 2, 3\}$

125 Given 3 is a root of $f(x) = x^4 - x^3 - 21x^2 + 45x$, what are the other unique roots of $f(x)$?
1 -5, only
2 -5 and 0
3 -3, 1 and 5
4 -5, -3 and 0

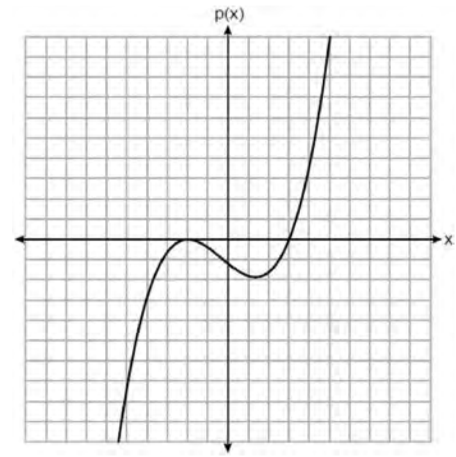
126 Algebraically determine the zeros of the function below.

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

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

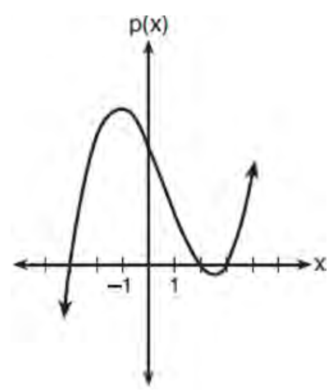
A.APR.B.3: GRAPHING POLYNOMIAL FUNCTIONS

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



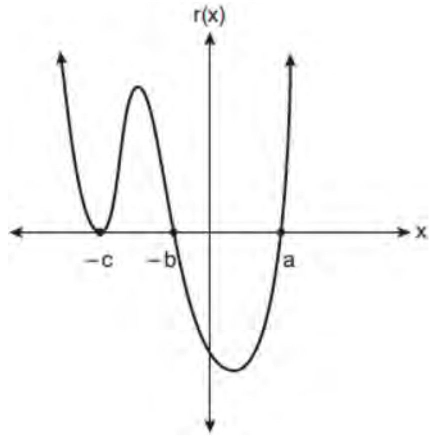
If $p(x)$ is written as a product of linear factors, which factor would appear twice?
1 $x - 2$
2 $x + 2$
3 $x - 3$
4 $x + 3$

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



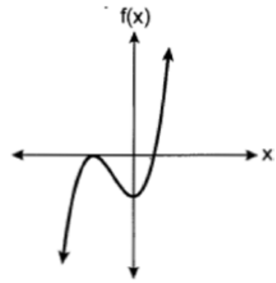
Which equation could represent $p(x)$?
1 $p(x) = (x^2 - 9)(x - 2)$
2 $p(x) = x^3 - 2x^2 + 9x + 18$
3 $p(x) = (x^2 + 9)(x - 2)$
4 $p(x) = x^3 + 2x^2 - 9x - 18$

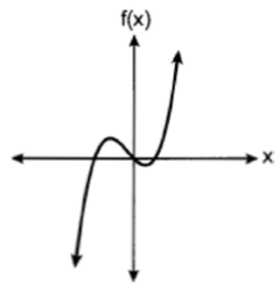
130 A sketch of $r(x)$ is shown below.

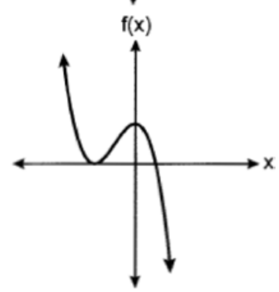


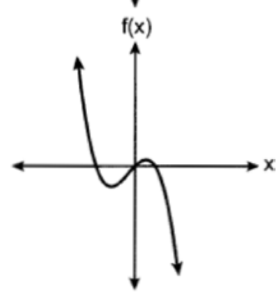
An equation for $r(x)$ could be
1 $r(x) = (x-a)(x+b)(x+c)$
2 $r(x) = (x+a)(x-b)(x-c)^2$
3 $r(x) = (x+a)(x-b)(x-c)$
4 $r(x) = (x-a)(x+b)(x+c)^2$

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

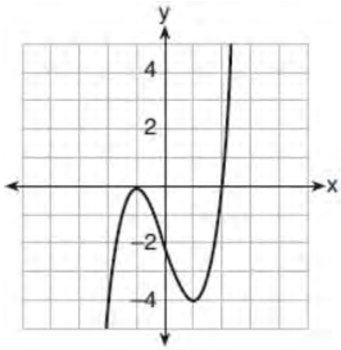
1 

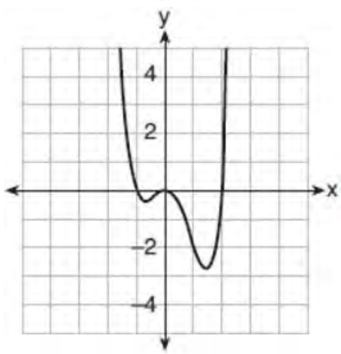
2 

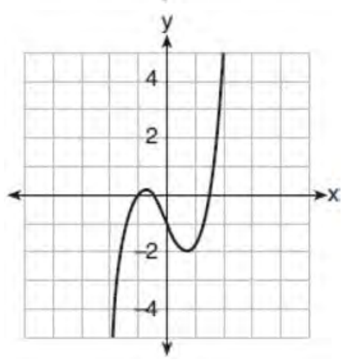
3 

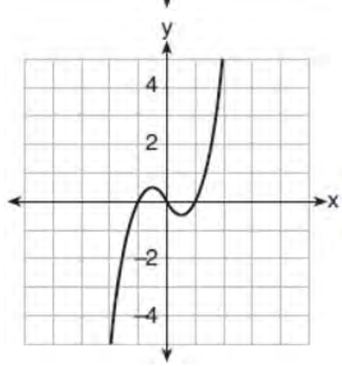
4 

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

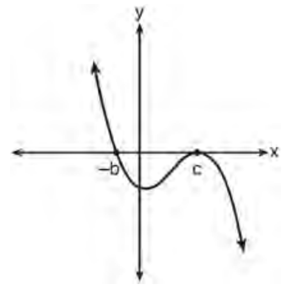
1


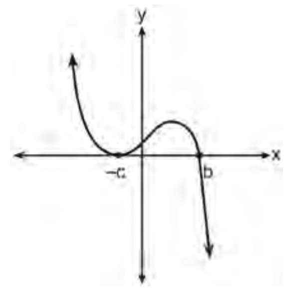
2


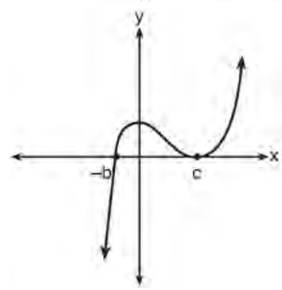
3


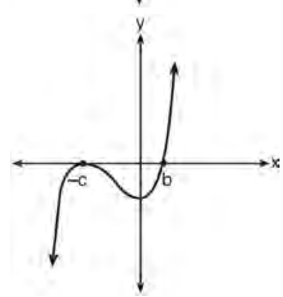
4


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

1


2


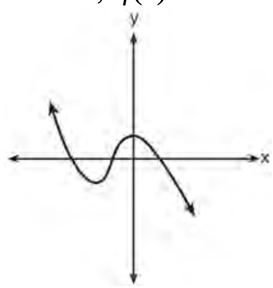
3


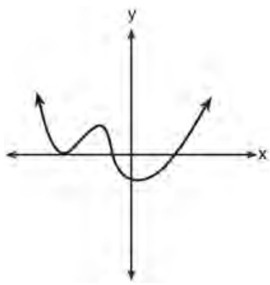
4


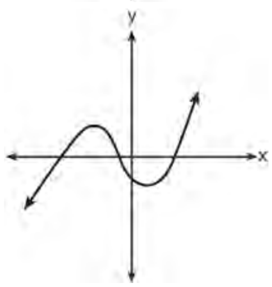
F.IF.B.4: GRAPHING POLYNOMIAL FUNCTIONS

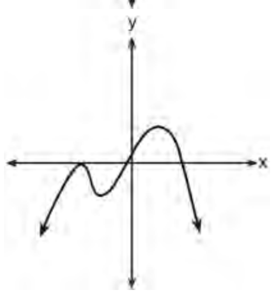
134 Which graph has the following characteristics?

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

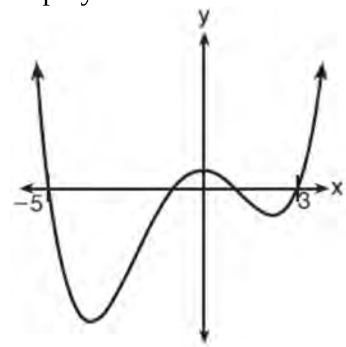
1 

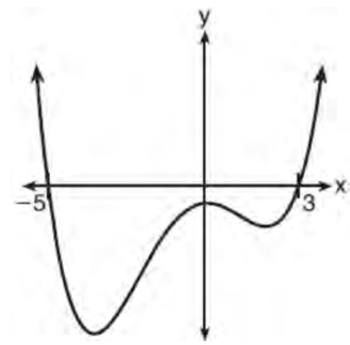
2 

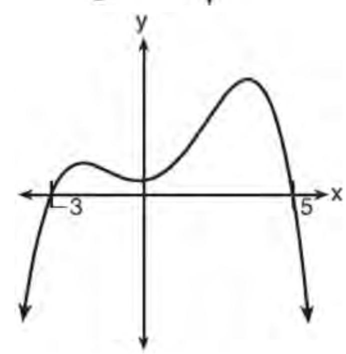
3 

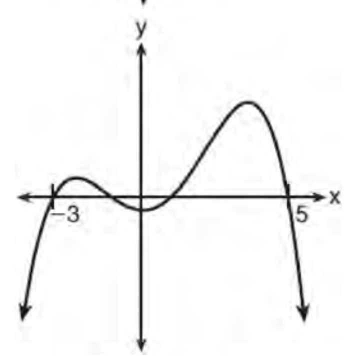
4 

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

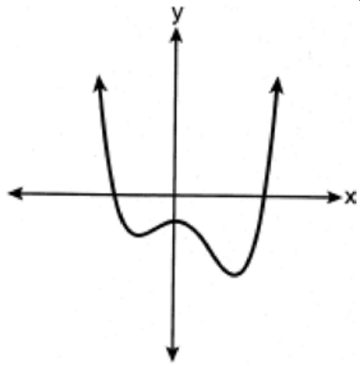
1 

2 

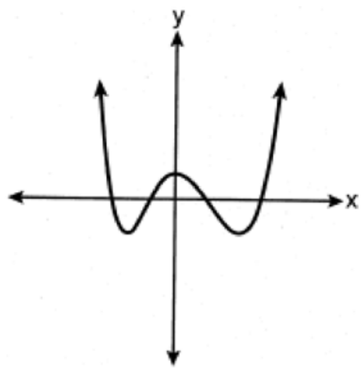
3 

4 

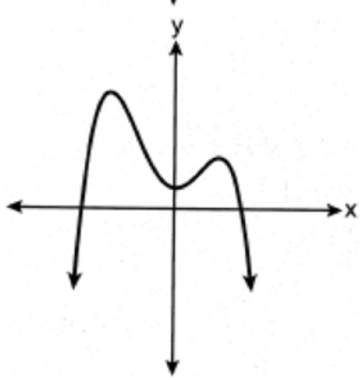
136 Which graph could represent a 4th degree polynomial function with a positive leading coefficient, 2 real zeros, and 2 imaginary zeros?



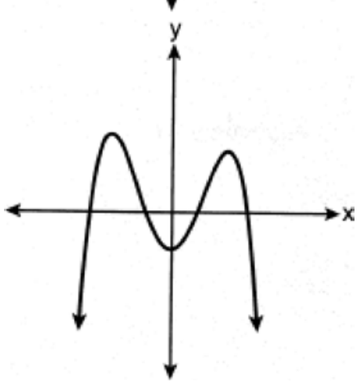
1



2

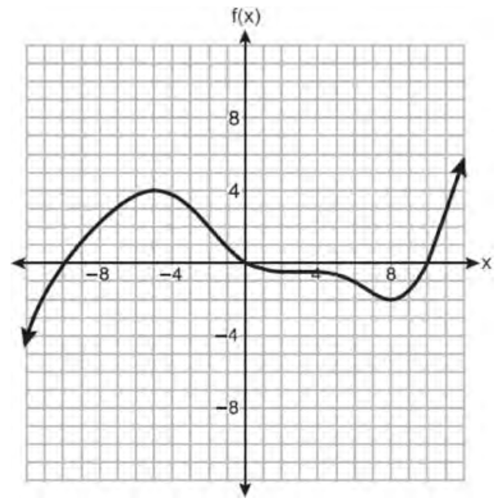


3



4

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



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

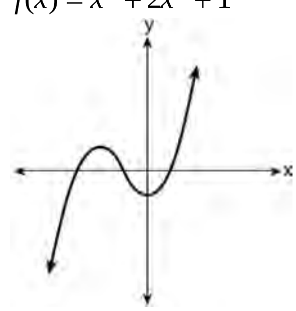
1 $(-2,4)$
2 $(0,10)$
3 $(-12,-5)$
4 $(-10,0)$

138 Consider the end behavior description below.

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

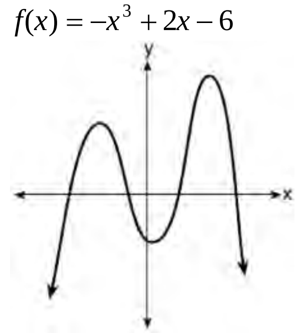
Which function satisfies the given conditions?

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



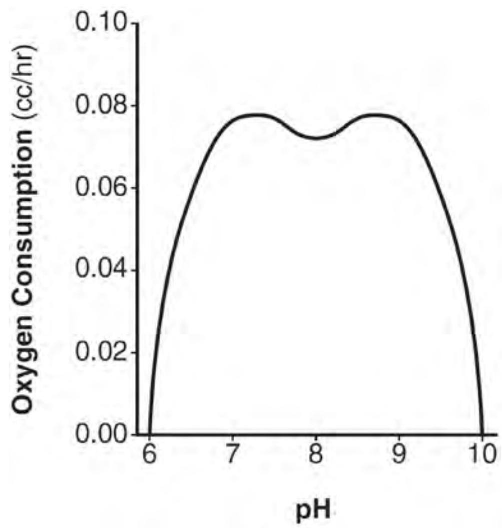
2

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



4

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



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

140 The average cost of a gallon of milk in the United States between the years of 1995 and 2018 can be modeled by the equation $P(t) = -0.0004t^3 + 0.0114t^2 - 0.0150t + 2.6602$, where $P(t)$ represents the cost, in dollars, and t is time in years since January 1995. During this time period, in what year did $P(t)$ reach its maximum?
1 1995
2 2013
3 2014
4 2018

141 Consider a cubic polynomial with the characteristics below.
- exactly one real root
- as $x \to \infty$, $f(x) \to -\infty$

Given $a > 0$ and $b > 0$, which equation represents a cubic polynomial with these characteristics?
1 $f(x) = (x-a)(x^2+b)$
2 $f(x) = (a-x)(x^2+b)$
3 $f(x) = (a-x^2)(x^2+b)$
4 $f(x) = (x-a)(b-x^2)$

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

143 Given $f(x) = x^4 - x^3 - 6x^2$, for what values of x will $f(x) > 0$?
1 $x < -2$, only
2 $x < -2$ or $x > 3$
3 $x < -2$ or $0 \le x \le 3$
4 $x > 3$, only

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

$$I(t) = 0.5t^4 + 3.45t^3 - 96.65t^2 + 347.7t,$$
$$\text{where } 0 \le t \le 6$$

Over what time interval does the amount of medication in the bloodstream strictly increase?
1 0 to 2 hours
2 0 to 3 hours
3 2 to 6 hours
4 3 to 6 hours

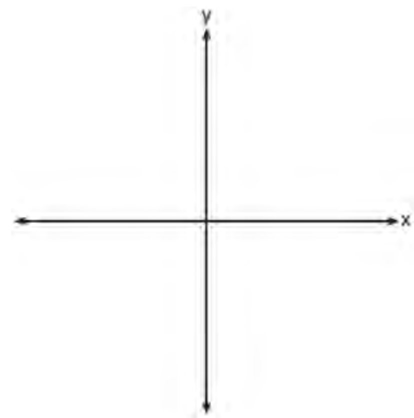
145 The function below models the average price of gas in a small town since January 1st.
$G(t) = -0.0049t^4 + 0.0923t^3 - 0.56t^2 + 1.166t + 3.23$, where $0 \le t \le 10$.
If $G(t)$ is the average price of gas in dollars and t represents the number of months since January 1st, the absolute maximum $G(t)$ reaches over the given domain is about
1 $1.60
2 $3.92
3 $4.01
4 $7.73

146 A polynomial equation of degree three, $p(x)$, is used to model the volume of a rectangular box. The graph of $p(x)$ has x intercepts at -2, 10, and 14. Which statements regarding $p(x)$ could be true?
A. The equation of $p(x) = (x-2)(x+10)(x+14)$.
B. The equation of $p(x) = -(x+2)(x-10)(x-14)$.
C. The maximum volume occurs when $x = 10$.
D. The maximum volume of the box is approximately 56.
1 *A* and *C*
2 *A* and *D*
3 *B* and *C*
4 *B* and *D*

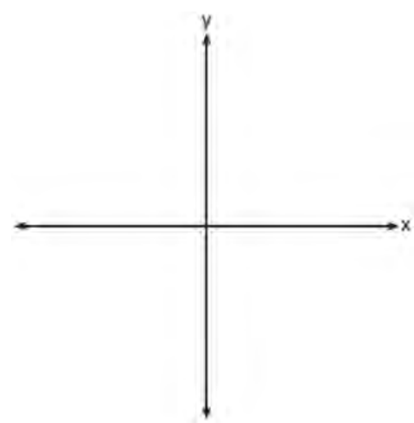
147 Factor completely over the set of integers: $16x^4 - 81$. Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

F.IF.C.7: GRAPHING POLYNOMIAL FUNCTIONS

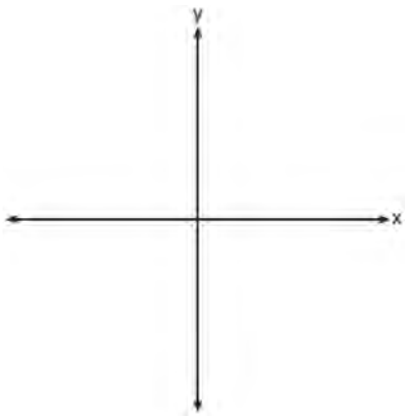
148 The zeros of a quartic polynomial function are 2, -2, 4, and -4. Use the zeros to construct a possible sketch of the function, on the set of axes below.



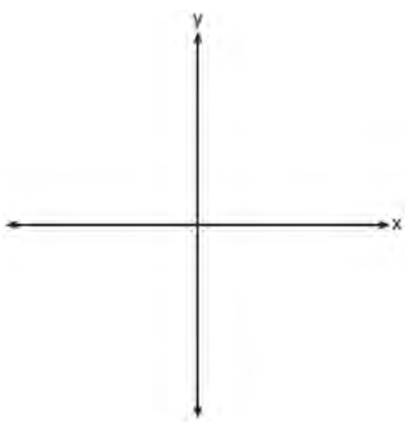
149 Sketch a graph of polynomial $P(x)$, given the criteria below:
- $P(x)$ has zeros only at $-5, 1$, and 4
- As $x \to \infty, P(x) \to -\infty$
- As $x \to -\infty, P(x) \to -\infty$



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

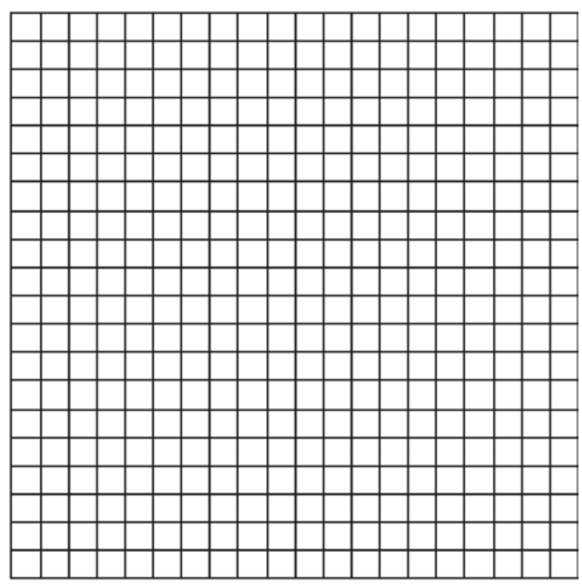


151 Patricia creates a cubic polynomial function, $p(x)$, with a leading coefficient of 1. The zeros of the function are 2, 3, and –6. Write an equation for $p(x)$. Sketch $y = p(x)$ on the set of axes below.

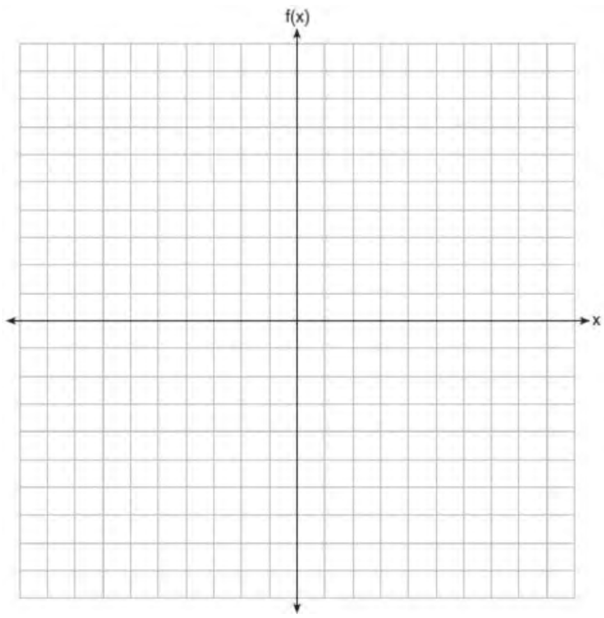


152 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and -2.

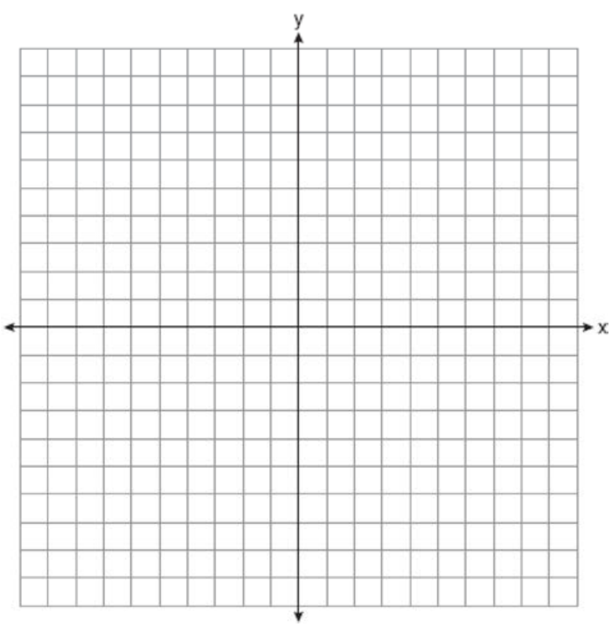
153 The zeros of a quartic polynomial function h are -1, ± 2, and 3. Sketch a graph of $y = h(x)$ on the grid below.



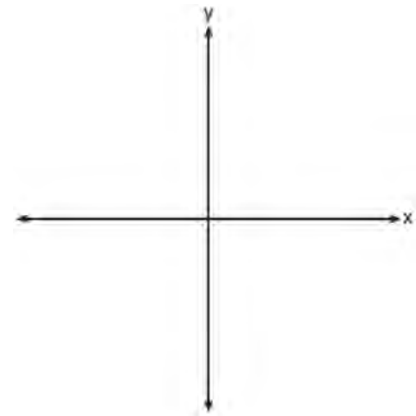
154 On the grid below, graph the function $f(x) = x^3 - 6x^2 + 9x + 6$ on the domain $-1 \le x \le 4$.



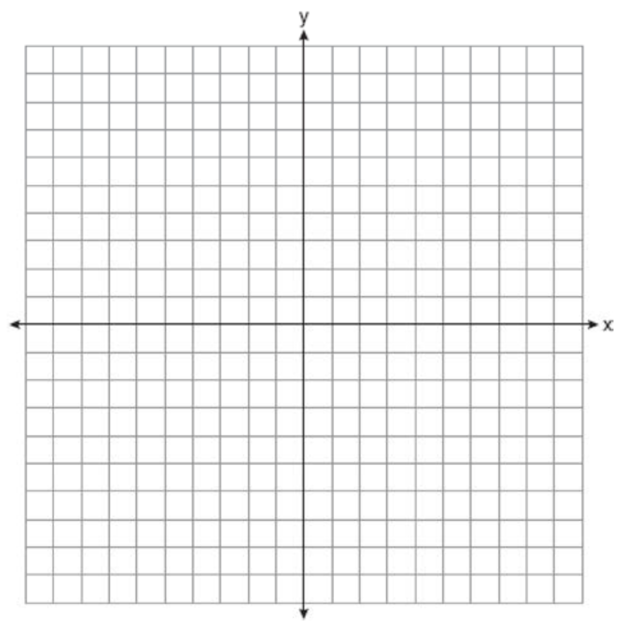
155 Graph $y = x^3 - 4x^2 + 2x + 7$ on the set of axes below.



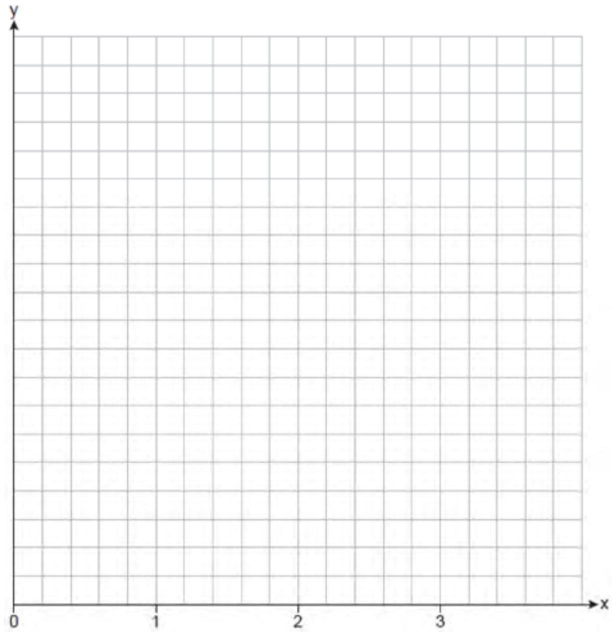
156 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$. On the axes below, sketch $y = c(x)$.



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



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

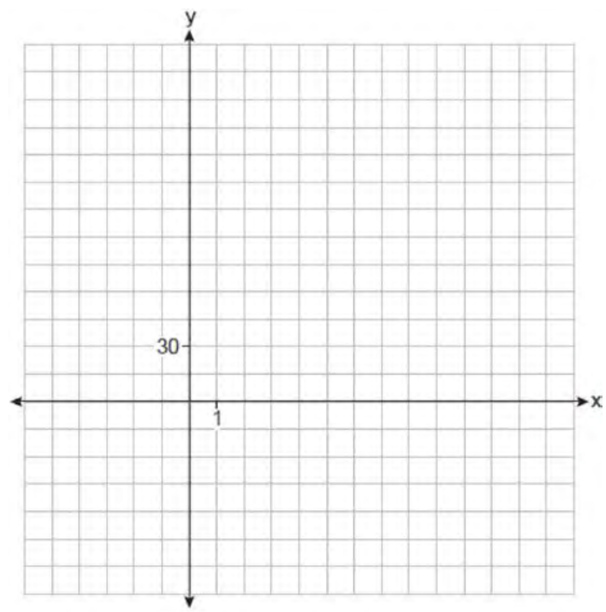


To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

159 A manufacturer of sweatshirts finds that profits and costs fluctuate depending on the number of products created. Creating more products doesn't always increase profits because it requires additional costs, such as building a larger facility or hiring more workers. The manufacturer determines the profit, $p(x)$, in thousands of dollars, as a function of the number of sweatshirts sold, x, in thousands. This function, p, is given below.

$$p(x) = -x^3 + 11x^2 - 7x - 69$$

Graph $y = p(x)$, over the interval $0 \le x \le 9$, on the set of axes below.

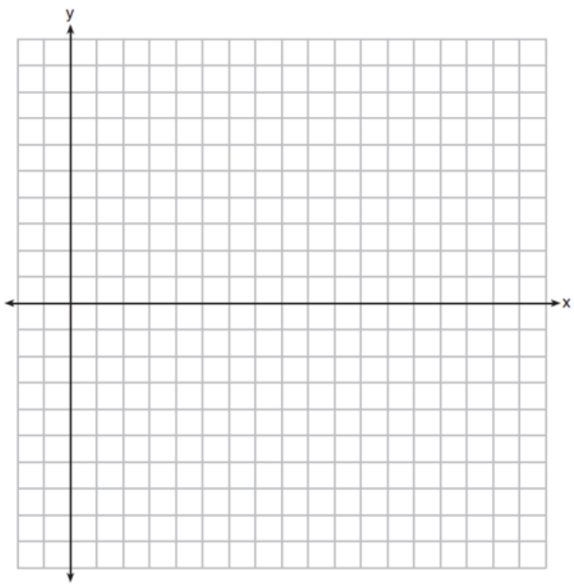


Over the given interval, state the coordinates of the maximum of p and round all values to the *nearest integer*. Explain what this point represents in terms of the number of sweatshirts sold and profit. Determine how many sweatshirts, to the *nearest whole sweatshirt*, the manufacturer would need to produce in order to first make a positive profit. Justify your answer.

160 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12,000x^2 + 83,000x + 7000$$
$$C(x) = 880x^3 - 21,000x^2 + 150,000x - 160,000$$

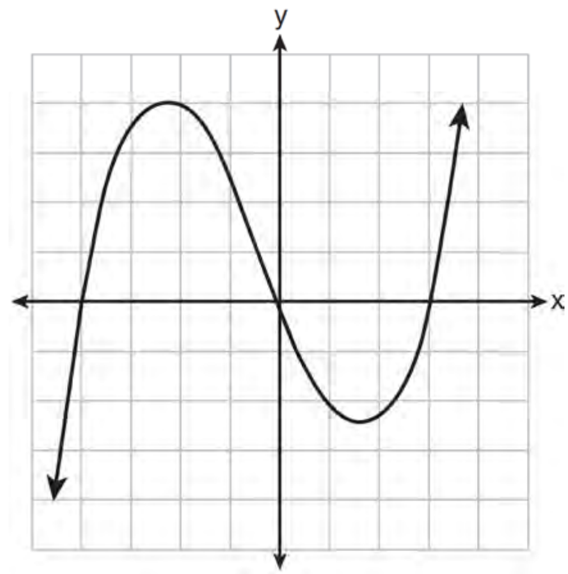
The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form. Graph $y = P(x)$ on the set of axes below over the domain $2 \le x \le 16$.



Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

A.APR.B.2: REMAINDER AND FACTOR THEOREMS

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



What is the remainder when $p(x)$ is divided by $x+4$?
1 $x-4$
2 -4
3 0
4 4

162 Which binomial is *not* a factor of the expression $x^3 - 11x^2 + 16x + 84$?
1 $x+2$
2 $x+4$
3 $x-6$
4 $x-7$

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

164 What is the remainder when $4x^3 - 3x + 3$ is divided by $x - 2$?
1 –23
2 –7
3 13
4 29

165 If $p(x) = 2x^3 - 3x + 5$, what is the remainder of $p(x) \div (x - 5)$?
1 –230
2 0
3 40
4 240

166 If $x - 1$ is a factor of $x^3 - kx^2 + 2x$, what is the value of k?
1 0
2 2
3 3
4 –3

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

168 If $x - 5$ is a factor of $p(x) = ax^4 + bx^3 + cx^2 + dx + e$, then which statement must be true?
1 $p(-5) = 0$
2 $p(-5) \neq 0$
3 $p(5) = 0$
4 $p(5) \neq 0$

169 Given $P(x) = x^3 - 3x^2 - 2x + 4$, which statement is true?
1 $(x - 1)$ is a factor because $P(-1) = 2$.
2 $(x + 1)$ is a factor because $P(-1) = 2$.
3 $(x + 1)$ is a factor because $P(1) = 0$.
4 $(x - 1)$ is a factor because $P(1) = 0$.

170 Consider the function $f(x) = 2x^3 + x^2 - 18x - 9$. Which statement is true?
1 $2x - 1$ is a factor of $f(x)$.
2 $x - 3$ is a factor of $f(x)$.
3 $f(3) \neq f\left(-\frac{1}{2}\right)$
4 $f\left(\frac{1}{2}\right) = 0$

171 For the polynomial $p(x)$, if $p(3) = 0$, it can be concluded that
1 $x + 3$ is a factor of $p(x)$
2 $x - 3$ is a factor of $p(x)$
3 when $p(x)$ is divided by 3, the remainder is zero
4 when $p(x)$ is divided by –3, the remainder is zero

172 When $g(x)$ is divided by $x + 4$, the remainder is 0. Given $g(x) = x^4 + 3x^3 - 6x^2 - 6x + 8$, which conclusion about $g(x)$ is true?
1 $g(4) = 0$
2 $g(-4) = 0$
3 $x - 4$ is a factor of $g(x)$.
4 No conclusion can be made regarding $g(x)$.

173 If $f(x) = 2x^4 - x^3 - 16x + 8$, then $f\left(\frac{1}{2}\right)$
1 equals 0 and $2x + 1$ is a factor of $f(x)$
2 equals 0 and $2x - 1$ is a factor of $f(x)$
3 does not equal 0 and $2x + 1$ is not a factor of $f(x)$
4 does not equal 0 and $2x - 1$ is a factor of $f(x)$

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

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

176 Use an appropriate procedure to show that $x-4$ is a factor of the function $f(x)=2x^3-5x^2-11x-4$. Explain your answer.

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

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

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

180 Given $r(x)=x^3-4x^2+4x-6$, find the value of $r(2)$. What does your answer tell you about $x-2$ as a factor of $r(x)$? Explain.

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

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

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

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

183 Evaluate $j(-1)$ given $j(x)=2x^4-x^3-35x^2+16x+48$. Explain what your answer tells you about $x+1$ as a factor. Algebraically find the remaining zeros of $j(x)$.

A.APR.C.4: POLYNOMIAL IDENTITIES

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

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

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

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

Step 3: $50x^2+25$

Step 4: $75x^2$

What statement is true regarding Emmeline's work?

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

185 The expression $(x+a)(x+b)$ can *not* be written as

1 $a(x+b)+x(x+b)$
2 $x^2+abx+ab$
3 $x^2+(a+b)x+ab$
4 $x(x+a)+b(x+a)$

186 Which equation does *not* represent an identity?

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

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

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

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

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

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

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

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

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

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

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

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

190 Which equation represents a polynomial identity?

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

191 The expression $\left(x^2+y^2\right)^2$ is *not* equivalent to

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

192 Which equation is true for all real values of x?

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

193 How many equations below are identities?

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

1 1
2 2
3 3
4 0

194 Given the following polynomials

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

Which identity is true?

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

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

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

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

197 Verify the following Pythagorean identity for all values of x and y:

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

198 Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a+b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result algebraically.

199 Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x-4)(2x^2 + hx + 3) + k$$

Algebra II Regents Exam Questions by State Standard: Topic

RADICALS

N.RN.A.1: RADICALS AND RATIONAL EXPONENTS

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

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

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

203 Explain what a rational exponent, such as $\frac{5}{2}$ means. Use this explanation to evaluate $9^{\frac{5}{2}}$.

N.RN.A.2: RADICALS AND RATIONAL EXPONENTS

204 For all positive values of x, which expression is equivalent to $x^{\frac{3}{4}}$?
1 $\sqrt[4]{x^3}$
2 $\sqrt[3]{x^4}$
3 $\left(x^3\right)^4$
4 $3\left(x^4\right)$

205 The expression $8^{\frac{x}{2}} \bullet 8^{\frac{x}{3}}$ is equivalent to
1 $\sqrt[6]{8^{5x}}$
2 $64^{\frac{5x}{6}}$
3 $\sqrt[5]{8^{2x}}$
4 $64^{\frac{x^2}{6}}$

206 Which expression is an equivalent form of $a\sqrt[5]{a^4}$?
1 a
2 $a^{\frac{9}{5}}$
3 $a^{\frac{9}{4}}$
4 $a^{\frac{1}{5}}$

207 Which expression is equivalent to $2xy^2\sqrt[3]{x^2y}$?
1 $2x^{\frac{5}{3}}y^{\frac{7}{3}}$
2 $2xy$
3 $2x^{\frac{2}{3}}y^{\frac{2}{3}}$
4 $2x^7y^4$

208 The expression $\sqrt[4]{81x^8y^6}$ is equivalent to
1 $3x^2y^{\frac{3}{2}}$
2 $3x^4y^2$
3 $9x^2y^{\frac{3}{2}}$
4 $9x^4y^2$

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

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

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

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

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

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

212 Given $x > 0$, the expression $\left(\dfrac{1}{x^{-2}}\right)^{-\frac{3}{4}}$ is equivalent to

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

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

1 $-\sqrt[6]{m^5}$
2 $\dfrac{1}{\sqrt[6]{m^5}}$
3 $-m\sqrt[5]{m}$
4 $\dfrac{1}{m\sqrt[5]{m}}$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

A.REI.A.2: SOLVING RADICALS

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

237 What is the solution set of $x = \sqrt{3x+40}$?
1 $\{-5,8\}$
2 $\{8\}$
3 $\{-4,10\}$
4 $\{\ \}$

238 The solution set for the equation $\sqrt{3(x+6)} = x$ is
1 $\{6,-3\}$
2 $\{-6,3\}$
3 $\{6\}$
4 $\{-3\}$

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

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

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

240 The solution set of the equation $x-1 = \sqrt{2x+6}$ is
1 $\{5,-1\}$
2 $\{5\}$
3 $\{-1\}$
4 $\{\ \}$

241 The solution set for the equation $x+1 = \sqrt{4x+25}$ is
1 $\{\ \}$
2 $\{6\}$
3 $\{6,-4\}$
4 $\{-4\}$

242 The solution set for the equation $b = \sqrt{2b^2-64}$ is
1 $\{-8\}$
2 $\{8\}$
3 $\{\pm 8\}$
4 $\{\ \}$

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

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

245 Jin solved the equation $\sqrt{4-x} = x+8$ by squaring both sides. What extraneous solution did he find?
1 -5
2 -12
3 3
4 4

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

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

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

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

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

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

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

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

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

255 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$. How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

256 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2. The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing. Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

257 The Beaufort Wind Scale was devised by British Rear Admiral Sir Francis Beaufort, in 1805 based upon observations of the effects of the wind. Beaufort numbers, B, are determined by the equation $B = 1.69\sqrt{s + 4.45} - 3.49$, where s is the speed of the wind in mph, and B is rounded to the nearest integer from 0 to 12.

Beaufort Wind Scale	
Beaufort Number	**Force of Wind**
0	Calm
1	Light air
2	Light breeze
3	Gentle breeze
4	Moderate breeze
5	Fresh breeze
6	Steady breeze
7	Moderate gale
8	Fresh gale
9	Strong gale
10	Whole gale
11	Storm
12	Hurricane

Using the table above, classify the force of wind at a speed of 30 mph. Justify your answer. In 1946, the scale was extended to accommodate strong hurricanes. A strong hurricane received a B value of exactly 15. Algebraically determine the value of s, to the *nearest mph*. Any B values that round to 10 receive a Beaufort number of 10. Using technology, find an approximate range of wind speeds, to the *nearest mph*, associated with a Beaufort number of 10.

POWERS

A.SSE.B.3: MODELING EXPONENTIAL FUNCTIONS

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

1 $A = 300\left[(1.00225)^{12}\right]^t$

2 $A = 300(0.08558)^{12t}$

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

4 $A = (300)^{12t}(1)^{12t} + \left(\frac{0.027}{12}\right)^{12t}$

259 Stephanie found that the number of white-winged cross bills in an area can be represented by the formula $C = 550(1.08)^t$, where t represents the number of years since 2010. Which equation correctly represents the number of white-winged cross bills in terms of the monthly rate of population growth?

1 $C = 550(1.00643)^t$

2 $C = 550(1.00643)^{12t}$

3 $C = 550(1.00643)^{\frac{t}{12}}$

4 $C = 550(1.00643)^{t+12}$

260 A study of the annual population of the red-winged blackbird in Ft. Mill, South Carolina, shows the population, $B(t)$, can be represented by the function $B(t) = 750(1.16)^t$, where the t represents the number of years since the study began. In terms of the monthly rate of growth, the population of red-winged blackbirds can be best approximated by the function

1 $B(t) = 750(1.012)^t$

2 $B(t) = 750(1.012)^{12t}$

3 $B(t) = 750(1.16)^{12t}$

4 $B(t) = 750(1.16)^{\frac{t}{12}}$

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

1 $H(t) = 50(1.015)^{12t}$

2 $H(t) = 50(1.15)^{\frac{t}{12}}$

3 $H(t) = 50(1.19)^{12t}$

4 $H(t) = 50(1.19)^{\frac{t}{12}}$

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

1 $P(t) = 3500(1.00206)^{12t}$

2 $P(t) = 3500(1.00206)^{\frac{t}{12}}$

3 $P(t) = 3500(1.34489)^{12t}$

4 $P(t) = 3500(1.34489)^{\frac{t}{12}}$

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

1 $P(t) = 500(1.00247)^{12t}$

2 $P(t) = 500(1.00247)^t$

3 $P(t) = 500(1.03)^{12t}$

4 $P(t) = 500(1.03)^{\frac{t}{12}}$

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

1 $y = 166.67(1.04)^{0.12t}$

2 $y = 2000(1.01)^t$

3 $y = 2000(1.0032737)^{12t}$

4 $y = 166.67(1.0032737)^t$

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

1 $f(x) = 35,000(1.0027)^{12x}$

2 $f(x) = 35,000(1.0027)^{\frac{x}{12}}$

3 $f(x) = 35,000(1.0325)^{12x}$

4 $f(x) = 35,000(1.0325)^{\frac{x}{12}}$

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

1 $(1.0525)^m$

2 $(1.0525)^{\frac{12}{m}}$

3 $(1.00427)^m$

4 $(1.00427)^{\frac{m}{12}}$

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

1 $400(1.001153846)^t$

2 $400(1.001121184)^t$

3 $400(1.001153846)^{52t}$

4 $400(1.001121184)^{52t}$

268 A student studying public policy created a model for the population of Detroit, where the population decreased 25% over a decade. He used the model $P = 714(0.75)^d$, where P is the population, in thousands, d decades after 2010. Another student, Suzanne, wants to use a model that would predict the population after y years. Suzanne's model is best represented by

1 $P = 714(0.6500)^y$

2 $P = 714(0.8500)^y$

3 $P = 714(0.9716)^y$

4 $P = 714(0.9750)^y$

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

1 $P = 12,150(0.461)^d$
2 $P = 12,150(0.679)^d$
3 $P = 12,150(0.996)^d$
4 $P = 12,150(0.998)^d$

270 On average, college seniors graduating in 2012 could compute their growing student loan debt using the function $D(t) = 29,400(1.068)^t$, where t is time in years. Which expression is equivalent to $29,400(1.068)^t$ and could be used by students to identify an approximate daily interest rate on their loans?

1 $29,400\left(1.068^{\frac{1}{365}}\right)^t$
2 $29,400\left(\frac{1.068}{365}\right)^{365t}$
3 $29,400\left(1+\frac{0.068}{365}\right)^t$
4 $29,400\left(1.068^{\frac{1}{365}}\right)^{365t}$

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

1 $A(t) = 150(1.14869)^{\frac{t}{7}}$
2 $A(t) = 150(1.14869)^{7t}$
3 $A(t) = 150(1.00283)^{\frac{t}{7}}$
4 $A(t) = 150(1.00283)^{7t}$

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

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

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

1 $A = 100\left(\frac{73.83}{2}\right)^t$
2 $A = 100\left(\frac{1}{147.66}\right)^t$
3 $A = 100(0.990656)^t$
4 $A = 100(0.116381)^t$

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

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

This function can be best approximated by

1 $I = I_0 e^{\left(-\frac{t}{0.18}\right)}$

2 $I = I_0 e^{5t}$

3 $I = I_0 (0.0067)^t$

4 $I = I_0 (0.0497)^{0.6t}$

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

1 $f(t) = 10{,}000(1.9)^t + 10{,}000e^{0.8t}$

2 $f(t) = 10{,}000(1.009)^t + 10{,}000e^{0.008t}$

3 $f(t) = 10{,}000(1.075)^{12t} + 10{,}000e^{0.8t}$

4 $f(t) = 10{,}000(1.00075)^{12t} + 10{,}000e^{0.008t}$

276 For a given time, x, in seconds, an electric current, y, can be represented by $y = 2.5\left(1 - 2.7^{-.10x}\right)$.

Which equation is *not* equivalent?

1 $y = 2.5 - 2.5\left(2.7^{-.10x}\right)$

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

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

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

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

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

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

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

F.BF.A.1: MODELING EXPONENTIAL FUNCTIONS

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

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

2 $A_0(25)^{\frac{t}{2}}$

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

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

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

1 $1000e^{3t}$

2 $1000(3)^t$

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

4 $1000(3)^{\frac{t}{10}}$

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

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

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

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

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

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

283 Audra is interested in studying the number of students entering kindergarten in the Ahlville Central School District over the next several years. Using data dating back to 2015, she determines that the number of kindergarteners is decreasing at an exponential rate. She creates a formula to model this situation $y = a(b)^x$, where x is the number of years since 2015 and y is the number of students entering kindergarten. If there were 105 students entering kindergarten in Ahlville in 2015, which statement about Audra's formula is true?

1 a is positive and b is negative.
2 a is negative and b is positive.
3 Both a and b are positive.
4 Both a and b are negative.

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

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

F.LE.A.2: MODELING EXPONENTIAL EQUATIONS

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

1 56
2 152
3 3688
4 81,920

287 If \$5000 is put into a savings account that pays 3.5% interest compounded monthly, how much money, to the *nearest ten cents*, would be in that account after 6 years, assuming no money was added or withdrawn?
1 \$5177.80
2 \$5941.30
3 \$6146.30
4 \$6166.50

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

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

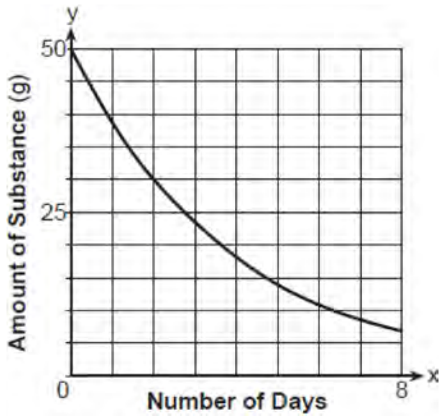
What approximate amount of sodium iodide-131 will remain in the body after 18 hours?
1 0.001
2 0.136
3 0.271
4 0.543

289 A population of 950 bacteria grows continuously at a rate of 4.75% per day. Write an exponential function, $N(t)$, that represents the bacterial population after t days and explain the reason for your choice of base. Determine the bacterial population after 36 hours, to the *nearest bacterium*.

290 Titanium-44 is a radioactive isotope such that every 63 years, its mass decreases by half. For a sample of titanium-44 with an initial mass of 100 grams, write a function that will give the mass of the sample remaining after any amount of time. Define all variables. Scientists sometimes use the average yearly decrease in mass for estimation purposes. Use the average yearly decrease in mass of the sample between year 0 and year 10 to predict the amount of the sample remaining after 40 years. Round your answer to the *nearest tenth*. Is the actual mass of the sample or the estimated mass greater after 40 years? Justify your answer.

F.LE.B.5: MODELING EXPONENTIAL EQUATIONS

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



The daily rate of decay over an 8-day interval is approximately
1 23%
2 95%
3 5%
4 77%

292 The value of an automobile t years after it was purchased is given by the function $V = 38,000(0.84)^t$. Which statement is true?
1 The value of the car increases 84% each year.
2 The value of the car decreases 84% each year.
3 The value of the car increases 16% each year.
4 The value of the car decreases 16% each year.

293 A certain pain reliever is taken in 220 mg dosages and has a half-life of 12 hours. The function $A = 220\left(\frac{1}{2}\right)^{\frac{t}{12}}$ can be used to model this situation, where A is the amount of pain reliever in milligrams remaining in the body after t hours. According to this function, which statement is true?
1 Every hour, the amount of pain reliever remaining is cut in half.
2 In 12 hours, there is no pain reliever remaining in the body.
3 In 24 hours, there is no pain reliever remaining in the body.
4 In 12 hours, 110 mg of pain reliever is remaining.

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

295 An equation to represent the value of a car after t months of ownership is $v = 32,000(0.81)^{\frac{t}{12}}$. Which statement is *not* correct?
1 The car lost approximately 19% of its value each month.
2 The car maintained approximately 98% of its value each month.
3 The value of the car when it was purchased was $32,000.
4 The value of the car 1 year after it was purchased was $25,920.

296 If $f(t) = 50(.5)^{\frac{t}{5715}}$ represents a mass, in grams, of carbon-14 remaining after t years, which statement(s) must be true?

I. The mass of the carbon-14 is decreasing by half each year.

II. The mass of the original sample is 50 g.

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

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

I. The current population is 110 million.

II. The population increases continuously by approximately 3.9% per year.

This model supports
1 I, only
2 II, only
3 both I and II
4 neither I nor II

298 A savings account, S, has an initial value of \$50. The account grows at a 2% interest rate compounded n times per year, t, according to the function below.

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

Which statement about the account is correct?
1 As the value of n increases, the amount of interest per year decreases.
2 As the value of n increases, the value of the account approaches the function $S(t) = 50e^{0.02t}$.
3 As the value of n decreases to one, the amount of interest per year increases.
4 As the value of n decreases to one, the value of the account approaches the function $S(t) = 50(1-0.02)^t$.

F.IF.B.4: EVALUATING EXPONENTIAL EXPRESSIONS

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

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

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

Robert's monthly payment will be
1 \$298.31
2 \$300.36
3 \$307.35
4 \$367.10

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

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

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

What is the monthly payment if they would like to pay off the loan in five years?
1 \$262.99
2 \$252.13
3 \$915.24
4 \$885.76

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

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

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

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

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

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

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

303 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of \$21,000 and a \$1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

$P_n =$ present amount borrowed
$n =$ number of monthly pay periods
$PMT =$ monthly payment
$i =$ interest rate per month

The affordable monthly payment is \$300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.

304 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage. With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*. Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

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

1 325
2 200
3 185
4 140

F.IF.B.4: EVALUATING LOGARITHMIC EXPRESSIONS

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

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

How would a sound with intensity 6.3×10^{-3} W/m^2 be classified?
1 moderate
2 loud
3 very loud
4 deafening

F.IF.C.7: GRAPHING EXPONENTIAL FUNCTIONS

307 Which function represents exponential decay?
1 $y = 2^{0.3t}$
2 $y = 1.2^{3t}$
3 $y = \left(\frac{1}{2}\right)^{-t}$
4 $y = 5^{-t}$

308 Which function represents exponential decay?
1 $p(x) = \left(\frac{1}{4}\right)^{-x}$
2 $q(x) = 1.8^{-x}$
3 $r(x) = 2.3^{2x}$
4 $s(x) = 4^{\frac{x}{2}}$

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

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

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

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

311 If the function $g(x) = ab^x$ represents exponential growth, which statement about $g(x)$ is *false*?
1 $a > 0$ and $b > 1$
2 The y-intercept is $(0,a)$.
3 The asymptote is $y = 0$.
4 The x-intercept is $(b,0)$.

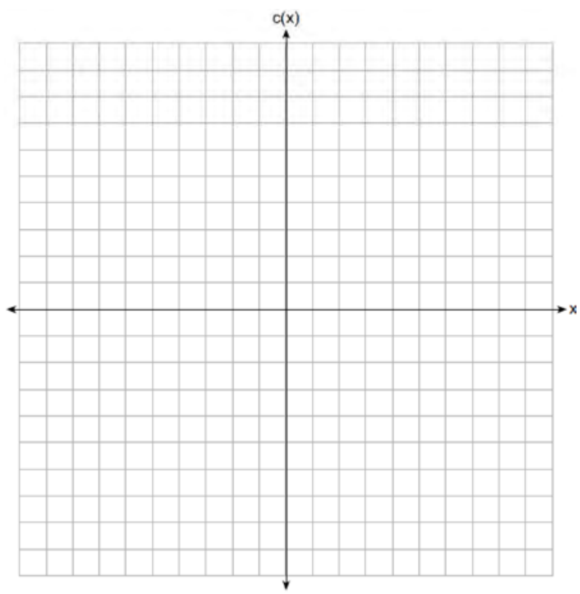
312 Which statement is true about the graph of $f(x) = \left(\frac{1}{8}\right)^x$?
1 The graph is always increasing.
2 The graph is always decreasing.
3 The graph passes through $(1,0)$.
4 The graph has an asymptote, $x = 0$.

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

314 Given $f(x) = 3^{x-1} + 2$, as $x \to -\infty$
1 $f(x) \to -1$
2 $f(x) \to 0$
3 $f(x) \to 2$
4 $f(x) \to -\infty$

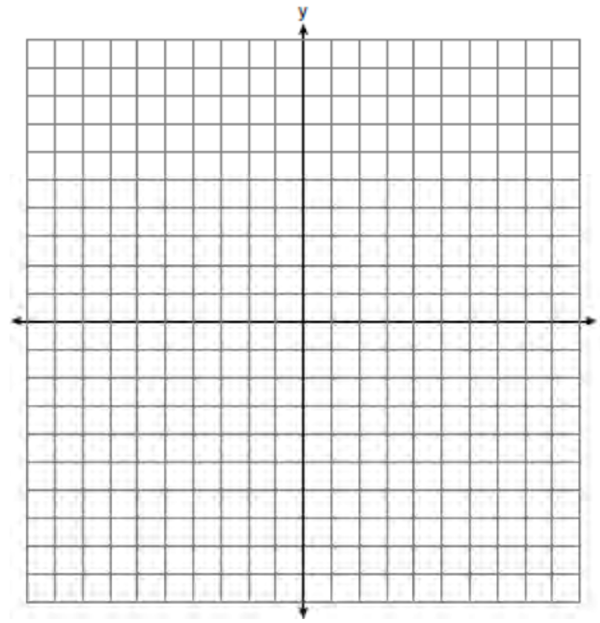
315 Describe the transformation applied to the graph of $p(x) = 2^x$ that forms the new function $q(x) = 2^{x-3} + 4$.

316 Graph $c(x) = -9(3)^{x-4} + 2$ on the axes below.

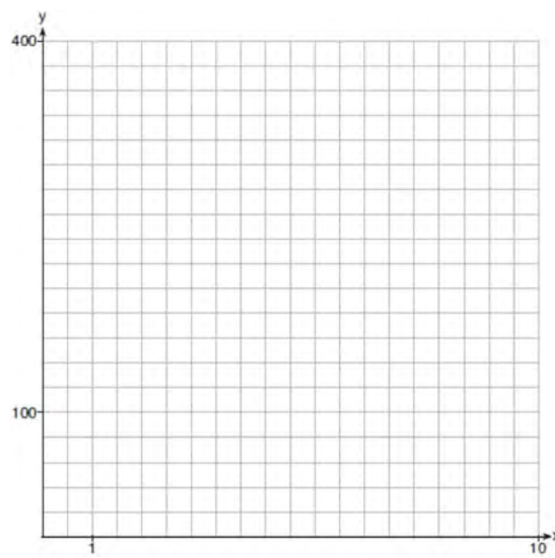


Describe the end behavior of $c(x)$ as x approaches positive infinity. Describe the end behavior of $c(x)$ as x approaches negative infinity.

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

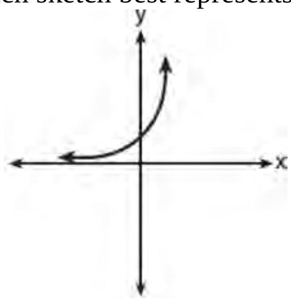


318 Graph $y = 400(.85)^{2x} - 6$ on the set of axes below.

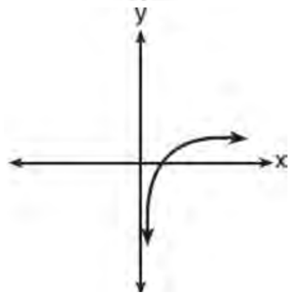


F.BF.B.5: INVERSE OF FUNCTIONS

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



1



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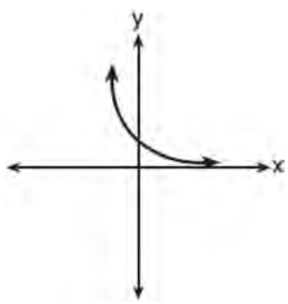

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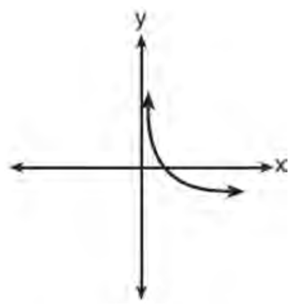


4

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

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

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

1 $y = x^3$
2 $y = \log_x 3$
3 $y = 3^x$
4 $x = 3^y$

322 Consider the function $f(x) = 2^x$. Is $f(x)$ an even function? Justify your answer. Write an equation for $g(x)$, the function that results after $f(x)$ is shifted up 5 units. Write an equation for $h(x)$, the inverse of $g(x)$.

F.IF.C.7: GRAPHING LOGARITHMIC FUNCTIONS

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

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

324 Which statement about the graph of $c(x) = \log_6 x$ is *false*?

1 The asymptote has equation $y = 0$.
2 The graph has no y-intercept.
3 The domain is the set of positive reals.
4 The range is the set of all real numbers.

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

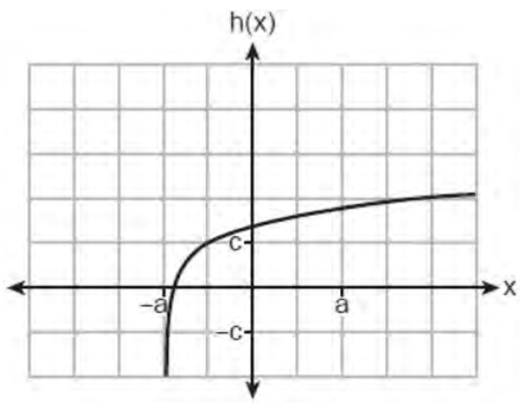
1 $f(x)$ has a y-intercept at $(0,2)$.
2 $-f(x)$ has a y-intercept at $(0,2)$.
3 As $x \to \infty$, $f(x) \to \infty$.
4 $x \to -4$, $f(x) \to \infty$.

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

1 $g(x) = \log_3(x+5)$
2 $g(x) = \log_3 x + 5$
3 $g(x) = \log_3(x-5)$
4 $g(x) = \log_3 x - 5$

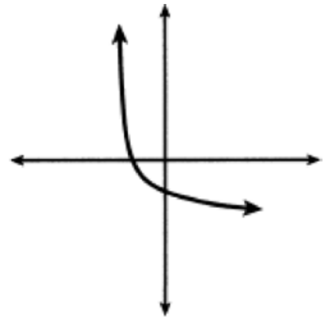
327 The graph of $y = \log_2 x$ is translated to the right 1 unit and down 1 unit. The coordinates of the x-intercept of the translated graph are
1 $(0,0)$
2 $(1,0)$
3 $(2,0)$
4 $(3,0)$

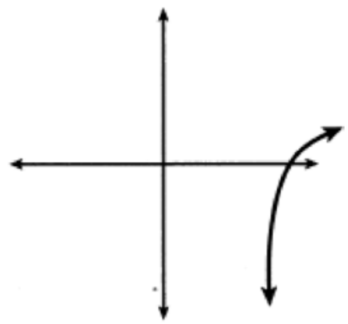
328 Which equation best represents the graph below?



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

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


1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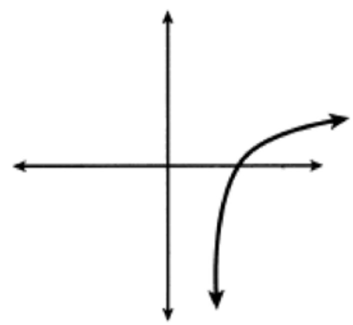
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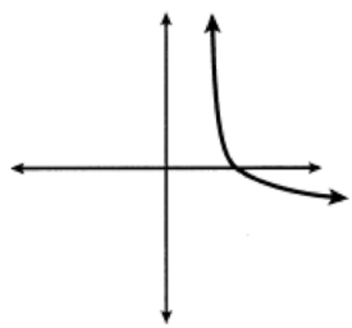
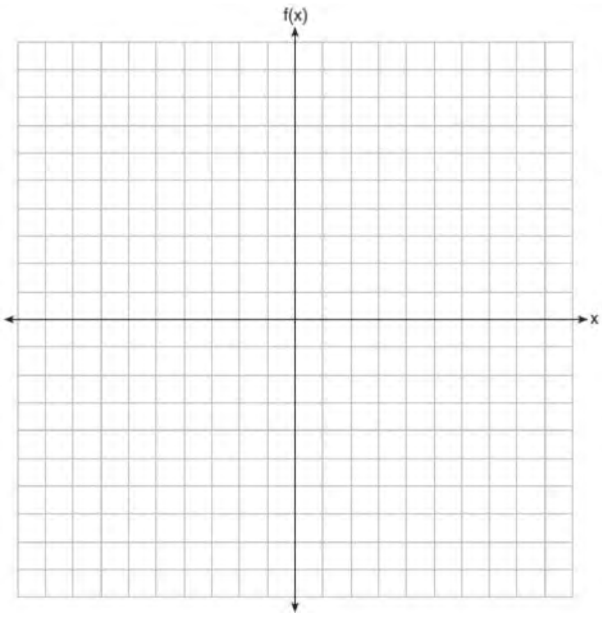
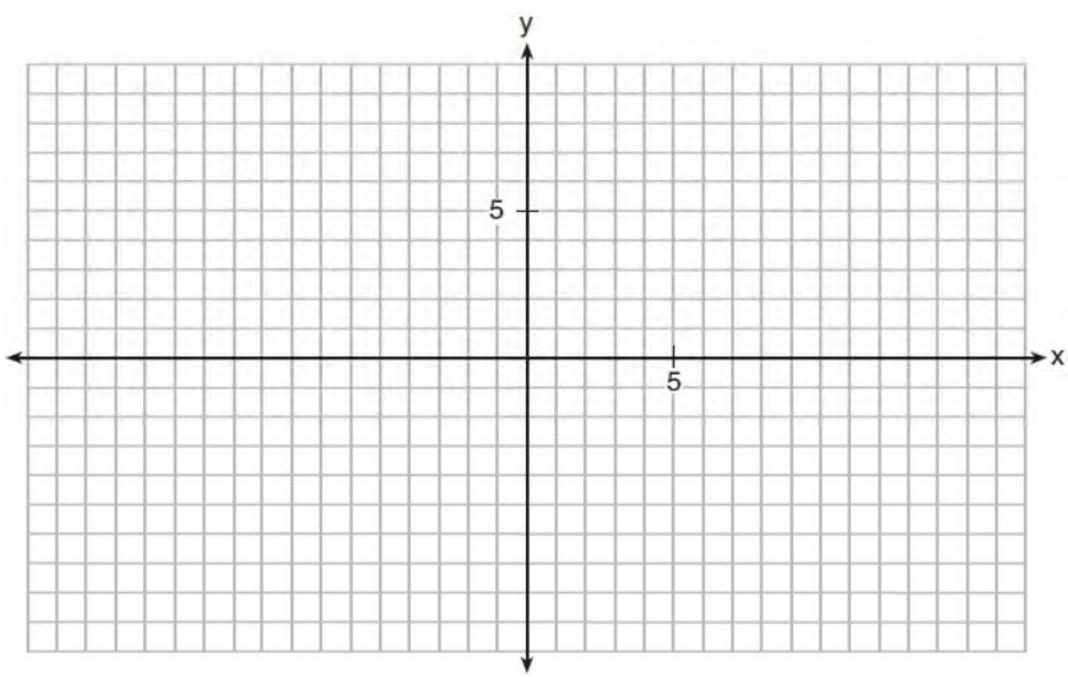

4

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

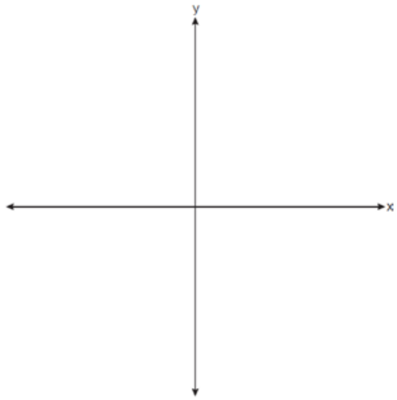
331 Graph $f(x) = \log_2(x+6)$ on the set of axes below.



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

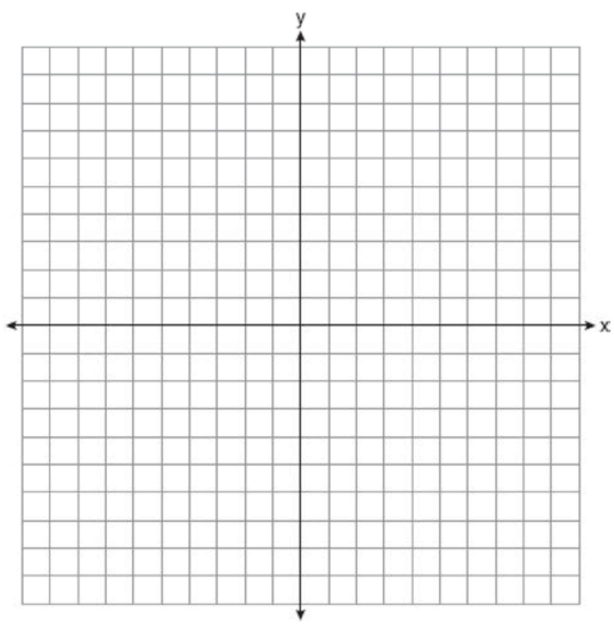


333 Sketch $p(x) = -\log_2(x+3)+2$ on the axes below.



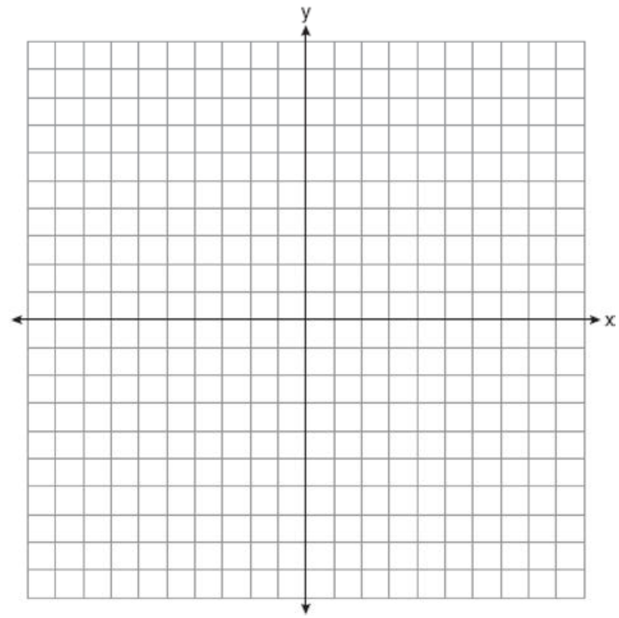
Describe the end behavior of $p(x)$ as $x \to -3$.
Describe the end behavior of $p(x)$ as $x \to \infty$

334 Graph $y = \log_2(x+3)-5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.



Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

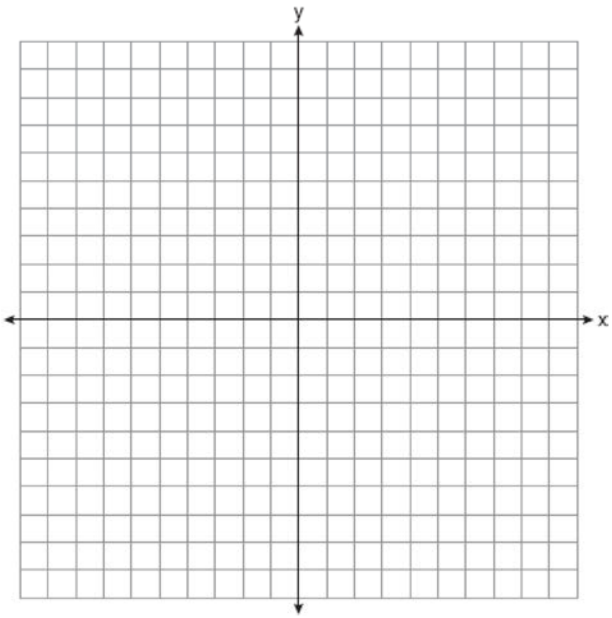
335 Graph $y = f(x)$, where $f(x) = \log_2(x-1)+3$ on the set of axes below.



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

336 Graph the following function on the axes below.

$$f(x) = \log_3(2 - x)$$



State the domain of f. State the equation of the asymptote.

F.LE.A.4: EXPRESS EXPONENTIALS AS LOGARITHMS

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

1 $\log_p\left(\frac{1}{2}\right) = q$

2 $\log_q(p) = \frac{1}{2}$

3 $\log_{\frac{1}{2}}(p) = q$

4 $\log_{\frac{1}{2}}(q) = p$

F.LE.A.4: EXPONENTIAL EQUATIONS

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

1 $x = \log_3(28) - 4$

2 $x = -1$

3 $x = \log(25) - 4$

4 $x = \frac{\log(56)}{\log(6)} - 4$

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

1 $\frac{2.3}{5}$

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

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

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

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

1 $\ln\left(\frac{c}{ab}\right)$

2 $\ln\left(\frac{cb}{a}\right)$

3 $\frac{\ln\left(\frac{c}{a}\right)}{b}$

4 $\frac{\ln\left(\frac{c}{a}\right)}{\ln b}$

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

1 -1

2 $\frac{\ln 36}{\ln 12} - 4$

3 $\ln(3) - 4$

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

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

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

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

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

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

1 0.583
2 1.945
3 4.220
4 14.066

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

1 1.1
2 2.5
3 6.3
4 68.5

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

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

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

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

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

F.LE.A.4: EXPONENTIAL GROWTH AND DECAY

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

1 $\dfrac{\ln 1.25}{0.25}$
2 $\dfrac{\ln 3000}{0.025}$
3 $\dfrac{\ln 1.25}{2.5}$
4 $\dfrac{\ln 1.25}{0.025}$

351 Judith puts \$5000 into an investment account with interest compounded continuously. Which approximate annual rate is needed for the account to grow to \$9110 after 30 years?

1 2%
2 2.2%
3 0.02%
4 0.022%

352 In New York State, the minimum wage has grown exponentially. In 1966, the minimum wage was \$1.25 an hour and in 2015, it was \$8.75. Algebraically determine the rate of growth to the *nearest percent.*

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

354 Determine, to the *nearest tenth of a year,* how long it would take an investment to double at a $3\frac{3}{4}\%$ interest rate, compounded continuously.

355 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.
a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.
b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

356 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account. Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

357 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option A will pay him 4.5% interest compounded annually. Option B will pay him 4.6% compounded quarterly. Write a function of option A and option B that calculates the value of each account after n years. Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option B will earn than option A to the *nearest cent*. Algebraically determine, to the *nearest tenth of a year*, how long it would take for option B to double Seth's initial investment.

358 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested \$8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously. Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years. Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*. Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

359 Taylor wants to open an investment account with the \$1200 she received for her birthday. She has narrowed her choices down to two banks. America's Bank offers 6.4% annual interest compounded quarterly. Barnyard Bank offers 6.35% annual interest compounded continuously. Write functions for $A(t)$ and $B(t)$ to represent the value of her investment with America's Bank and Barnyard Bank as a function of time, t, in years. Taylor would like to invest the \$1200 into one bank for ten years making no additional deposits and no withdrawals. With which bank will Taylor earn the most money? Justify your answer. Taylor chooses to invest her money in Barnyard Bank. Algebraically determine how long, to the *nearest tenth of a year*, it will take her initial investment to triple assuming she makes no deposits or withdrawals.

360 Monthly mortgage payments can be found using the formula below:

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

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

The Banks family would like to borrow $120,000 to purchase a home. They qualified for an annual interest rate of 4.8%. Algebraically determine the *fewest* number of whole years the Banks family would need to include in the mortgage agreement in order to have a monthly payment of no more than $720.

361 After sitting out of the refrigerator for a while, a turkey at room temperature (68°F) is placed into an oven at 8 a.m., when the oven temperature is 325°F. Newton's Law of Heating explains that the temperature of the turkey will increase proportionally to the difference between the temperature of the turkey and the temperature of the oven, as given by the formula below:

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

T_a = the temperature surrounding the object

T_0 = the initial temperature of the object

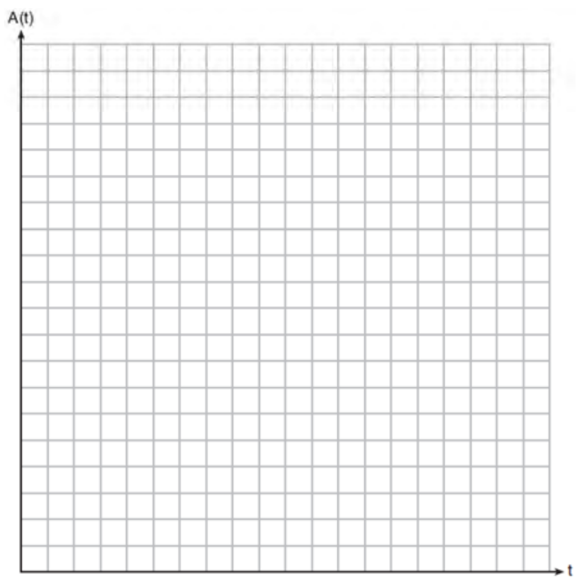
t = the time in hours

T = the temperature of the object after t hours

k = decay constant

The turkey reaches the temperature of approximately 100° F after 2 hours. Find the value of k, to the *nearest thousandth*, and write an equation to determine the temperature of the turkey after t hours. Determine the Fahrenheit temperature of the turkey, to the *nearest degree*, at 3 p.m.

362 Tony is evaluating his retirement savings. He currently has \$318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account. Write a function, $A(t)$, to represent the amount of money that will be in his account in t years. Graph $A(t)$ where $0 \le t \le 20$ on the set of axes below.



Tony's goal is to save \$1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal. Explain how your graph of $A(t)$ confirms your answer.

363 A retailer advertises that items will be discounted by 10% every Monday until they are sold. In how many weeks will an item costing \$50 first be sold for under half price?
1 7
2 6
3 5
4 4

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

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

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

Coffee at a temperature of 195°F is poured into a container. The room temperature is kept at a constant 68°F and $k = 0.05$. Coffee is safe to drink when its temperature is, at most, 120°F. To the *nearest minute*, how long will it take until the coffee is safe to drink?
1 7
2 10
3 11
4 18

366 One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

367 The half-life of a radioactive substance is 15 years. Write an equation that can be used to determine the amount, $s(t)$, of 200 grams of this substance that remains after t years. Determine algebraically, to the *nearest year*, how long it will take for $\frac{1}{10}$ of this substance to remain.

368 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m. Using this equation, solve for h, to the *nearest ten thousandth*. Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

369 Megan is performing an experiment in a lab where the air temperature is a constant 73ºF and the liquid is 237ºF. One and a half hours later, the temperature of the liquid is 112ºF. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours

T_a: air temperature

T_0: initial temperature of the liquid

k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid. Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours. Megan needs the temperature of the liquid to be 80ºF to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

RATIONALS

A.APR.D.6: UNDEFINED RATIONALS

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

1 2 or -4
2 4 or -2
3 3, only
4 2, only

A.APR.D.6: RATIONAL EXPRESSIONS

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

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

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

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

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

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

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

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

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

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

1 3

2 $-\frac{17}{2}$

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

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

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

1 $(x+3)^2-16$

2 $(x+3)^2-10(x+3)-2(x+3)+20$

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

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

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

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

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

1 $\frac{c+d}{d+2c}$

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

3 $\frac{-c-d}{d+2c}$

4 $\frac{-c+d}{d+2c}$

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

1 $2x^2+\frac{9}{x+2}$

2 $2x+\frac{7}{x+2}$

3 $2x+1+\frac{6}{x+2}$

4 $2x+9-\frac{10}{x+2}$

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

1 $2x^2+3x+4$

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

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

4 $2x^3-9x^2+22x-78$

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

1 x^2+3

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

3 $2x^2+x+6$

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

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

1 $2x^3+9x^2+23x+74$

2 $2x^2-3x+5-\frac{10}{x+3}$

3 $2x^3-3x^2+5x-10$

4 $2x^2+9x+23+\frac{74}{x+3}$

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

1 $2x^2+x-6-\dfrac{7}{x+3}$

2 $2x^2+13x-36+\dfrac{83}{x+3}$

3 $2x^2+x-13$

4 $x^2+4x-15+\dfrac{20}{x+3}$

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

1 $2x^3+4x^2+x-12+\dfrac{86}{x+6}$

2 $2x^3-4x^2-x+14$

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

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

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

1 x^2

2 $x^2+2x+4+\dfrac{6}{x-2}$

3 x^2-2

4 $x^2-2x+4-\dfrac{10}{x-2}$

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

1 $x^3-2x^2-x+6+\dfrac{2}{x+2}$

2 $x^3-5x+4-\dfrac{14}{x+2}$

3 $x^3+2x^2-x+2+\dfrac{18}{x+2}$

4 $x^3+2x^2-9x+22-\dfrac{30}{x+2}$

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

1 $2x^3-5x-12-\dfrac{38}{x-3}$

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

3 $2x^3-5x+18-\dfrac{56}{x-3}$

4 $2x^3-6x^2+13x-36+\dfrac{106}{x-3}$

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

1 $6x^2-8x+17+\dfrac{166}{x+2}$

2 $6x^2+16x+33+\dfrac{266}{x+2}$

3 $6x^3+16x^2+32x+65+\dfrac{330}{x+2}$

4 $6x^3-8x^2+16x-31+\dfrac{262}{x+2}$

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

1 $5x^2+x+3$

2 $5x^2-x+3$

3 $5x^2-x-3$

4 $5x^2+x-3$

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

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

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

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

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

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

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

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

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

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

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

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

1 $2x^2+3x-7+\frac{31}{2x+3}$
2 $2x^2-3x+7-\frac{11}{2x+3}$
3 $2x^2+2.5x+5+\frac{15}{2x+3}$
4 $2x^2-2.5x-5-\frac{20}{2x+3}$

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

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

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

398 Given $a(x)=x^4+2x^3+4x-10$ and $b(x)=x+2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x)+\frac{r(x)}{b(x)}$. Is $b(x)$ a factor of $a(x)$? Explain.

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

A.APR.D.7: ADDITION AND SUBTRACTION OF RATIONALS

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

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

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

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

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

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

403 The expression $2-\frac{x-1}{x+2}$ is equivalent to

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

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

A.CED.A.1: MODELING RATIONALS

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

1 $C(n)=329.99+108.78n$
2 $C(n)=329.99+326.34n$
3 $C(n)=\frac{329.99+108.78n}{n}$
4 $C(n)=\frac{329.99+326.34n}{n}$

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

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

407 Julie averaged 85 on the first three tests of the semester in her mathematics class. If she scores 93 on each of the remaining tests, her average will be 90. Which equation could be used to determine how many tests, T, are left in the semester?

1 $\frac{255+93T}{3T}=90$
2 $\frac{255+90T}{3T}=93$
3 $\frac{255+93T}{T+3}=90$
4 $\frac{255+90T}{T+3}=93$

Algebra II Regents Exam Questions by State Standard: Topic

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

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

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

1 10 or –2
2 10 or 2
3 –10 or –2
4 –10 or 2

410 Markus is a long-distance walker. In one race, he walked 55 miles in t hours and in another race walked 65 miles in $t+3$ hours. His rates are shown in the equations below.

$$r=\frac{55}{t} \quad r=\frac{65}{t+3}$$

Markus walked at an equivalent rate, r, for each race. Determine the number of hours that each of the two races took.

A.REI.A.2: SOLVING RATIONALS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 -3
2 -7
3 3
4 7

419 What is the solution, if any, of the equation $\frac{2}{x+3} - \frac{3}{4-x} = \frac{2x-2}{x^2-x-12}$?

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

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

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

421 To solve the equation $\frac{7}{x+7} + \frac{4x}{x-7} = \frac{3x+7}{x-7}$, Joan's first step is to multiply both sides by the least common denominator. Which statement is true?

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

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

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

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

1 $\frac{3}{2}\pm\frac{\sqrt{17}}{2}$
2 $\frac{3}{2}\pm\frac{\sqrt{17}}{2}i$
3 $\frac{3}{2}\pm\frac{\sqrt{33}}{2}$
4 $\frac{3}{2}\pm\frac{\sqrt{33}}{2}i$

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

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

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

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

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

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

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

431 Solve for x algebraically:
$\frac{1}{x-6}+\frac{x}{x-2}=\frac{4}{x^2-8x+12}$

432 A formula for work problems involving two people is shown below.

$$\frac{1}{t_1}+\frac{1}{t_2}=\frac{1}{t_b}$$

t_1 = the time taken by the first person to complete the job
t_2 = the time taken by the second person to complete the job
t_b = the time it takes for them working together to complete the job

Fred and Barney are carpenters who build the same model desk. It takes Fred eight hours to build the desk while it only takes Barney six hours. Write an equation that can be used to find the time it would take both carpenters working together to build a desk. Determine, to the *nearest tenth of an hour*, how long it would take Fred and Barney working together to build a desk.

SYSTEMS

A.REI.C.6: SOLVING LINEAR SYSTEMS

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

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

1 5
2 2
3 6
4 4

434 What is the value of y for the system shown below?

$$3x+4y-5z=-27$$
$$2x+3y-z=-3$$
$$6x-y+4z=3$$

1 −27
2 6
3 3
4 −3

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

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

1 -17
2 2
3 $-\frac{1}{5}$
4 -7

436 Consider the system below.

$$x + y + z = 9$$
$$x - y - z = -1$$
$$x - y + z = 21$$

Which value is *not* in the solution, (x,y,z), of the system?

1 -8
2 -6
3 11
4 4

437 Consider the system of equations below:

$$x + y - z = 6$$
$$2x - 3y + 2z = -19$$
$$-x + 4y - z = 17$$

Which number is *not* the value of any variable in the solution of the system?

1 -1
2 2
3 3
4 -4

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

$$a + 5b - c = -20$$
$$4a - 5b + 4c = 19$$
$$-a - 5b - 5c = 2$$

1 -2
2 2
3 3
4 -3

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

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

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

440 Consider the system of equations below?

$$x + 2y - z = 1$$
$$-x - 3y + 2z = 0$$
$$2x - 4y + z = 10$$

What is the solution to the given system of equations?

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

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

$$x + 3y + 5z = 45$$
$$6x - 3y + 2z = -10$$
$$-2x + 3y + 8z = 72$$

442 Solve the following system of equations algebraically for all values of a, b, and c.

$$a + 4b + 6c = 23$$
$$a + 2b + c = 2$$
$$6b + 2c = a + 14$$

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

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

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

$$2x+3y-4z=-1$$
$$x-2y+5z=3$$
$$-4x+y+z=16$$

445 Solve the following system of equations algebraically for x, y, and z.

$$2x+4y-3z=12$$
$$3x-2y+2z=-9$$
$$-x+y-3z=0$$

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

$$3x-8y+2z=-60$$
$$2x-7y-5z=-31$$
$$-6x+2y-4z=36$$

A.REI.C.7: QUADRATIC-LINEAR SYSTEMS

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

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

1 1
2 2
3 3
4 0

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

$$y=x^2-24$$
$$y=x-12$$

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

449 The graphs of the equations $y=x^2+4x-1$ and $y+3=x$ are drawn on the same set of axes. One solution of this system is

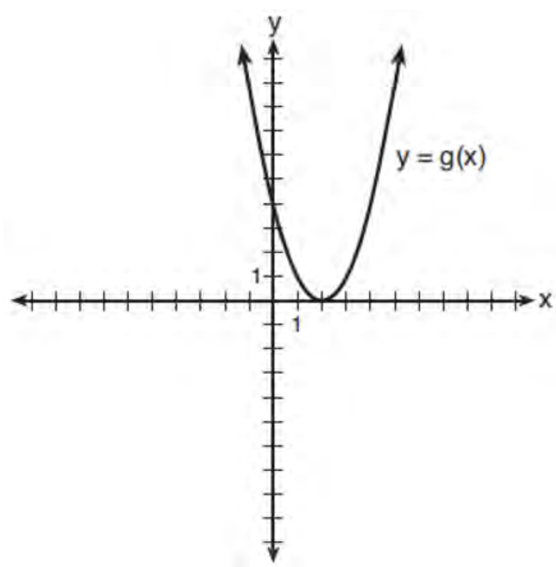
1 $(-5,-2)$
2 $(-1,-4)$
3 $(1,4)$
4 $(-2,-1)$

450 What is the solution set of the following system of equations?

$$y=3x+6$$
$$y=(x+4)^2-10$$

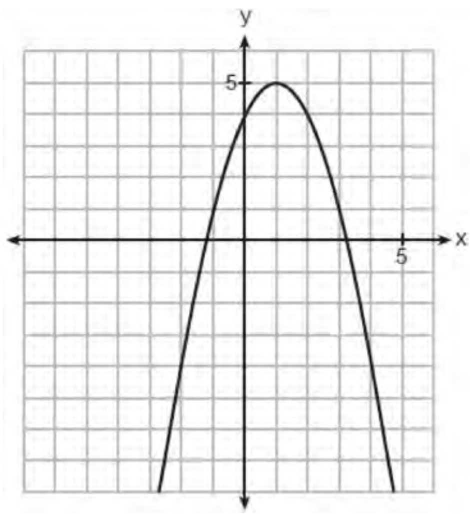
1 $\{(-5,-9)\}$
2 $\{(5,21)\}$
3 $\{(0,6),(-5,-9)\}$
4 $\{(0,6),(5,21)\}$

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



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

452 The graph of a quadratic function is shown below.



When the graph of $x + y = 4$ is drawn on the same axes, one solution to this system is
1 $(4,0)$
2 $(1,5)$
3 $(2,2)$
4 $(3,1)$

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

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

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

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

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

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

456 Consider the system shown below.

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

The two solutions of the system can be described as
1 both imaginary
2 both irrational
3 both rational
4 one rational and one irrational

457 Given $y = -2x$ and $x^2 + y^2 = 5$, the point of intersection in Quadrant II is
1 $(1,-2)$
2 $(-2,1)$
3 $(-1,1)$
4 $(-1,2)$

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

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

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

459 Solve the system of equations algebraically.

$$x^2 + y^2 = 25$$
$$y + 5 = 2x$$

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

$$y = x - 28$$

461 Algebraically solve the system:

$$(x-2)^2 + (y-3)^2 = 20$$
$$y = -2x + 7$$

462 Solve the system of equations shown below algebraically:

$$(x-4)^2 + (y-1)^2 = 9$$
$$x - y = 6$$

463 Solve the system of equations shown below algebraically.

$$(x-3)^2+(y+2)^2=16$$
$$2x+2y=10$$

464 Algebraically solve the following system of equations.

$$(x-2)^2+(y-3)^2=16$$
$$x+y-1=0$$

A.REI.D.11: QUADRATIC-LINEAR SYSTEMS

465 Sally's high school is planning their spring musical. The revenue, R, generated can be determined by the function $R(t)=-33t^2+360t$, where t represents the price of a ticket. The production cost, C, of the musical is represented by the function $C(t)=700+5t$. What is the highest ticket price, to the *nearest dollar*, they can charge in order to *not* lose money on the event?

1 $t=3$
2 $t=5$
3 $t=8$
4 $t=11$

A.REI.D.11: OTHER SYSTEMS

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

x	f(x)
–3.12	–4.88
0	–6
1.23	–4.77
8.52	2.53
9.01	3.01

x	g(x)
–2.01	–1.01
0	0.58
8.52	2.53
13.11	3.01
16.52	3.29

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

1 0
2 2.53
3 3.01
4 8.52

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

1 1
2 2
3 6
4 4

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

1 –3.9
2 –1.1
3 2.1
4 4.7

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

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

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

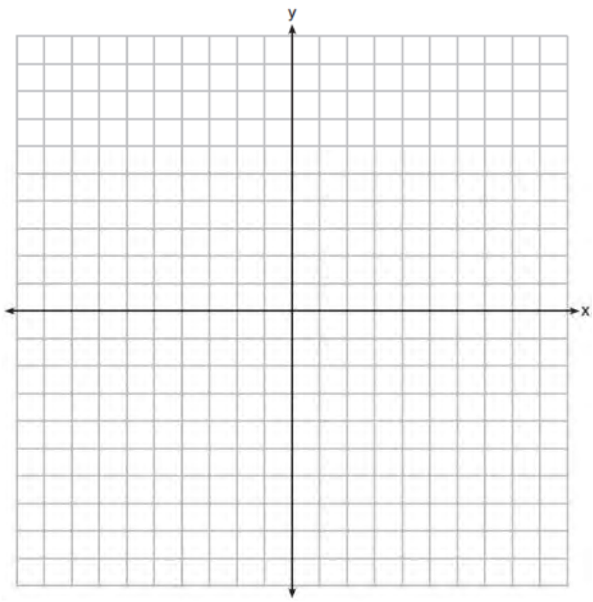
$$k(x)=-|0.7x|+5$$

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

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

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

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



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

472 To the *nearest tenth*, the value of x that satisfies $2^x = -2x + 11$ is
1 2.5
2 2.6
3 5.8
4 5.9

473 The equations $y = 3t + 6$ and $y = (1.82)^t$ approximately model the growth of two separate populations where $t > 0$. What is the best approximation of the time, t, at which the populations are the same?
1 −1.9
2 0.3
3 5.1
4 21.3

474 Pedro and Bobby each own an ant farm. Pedro starts with 100 ants and says his farm is growing exponentially at a rate of 15% per month. Bobby starts with 350 ants and says his farm is steadily decreasing by 5 ants per month. Assuming both boys are accurate in describing the population of their ant farms, after how many months will they both have approximately the same number of ants?
1 7
2 8
3 13
4 36

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

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

Assuming the trend continues, approximately how many years after the beginning of 2018 will it take for the populations to be equal?
1 7
2 20
3 68
4 125

476 During the summer, Adam saved \$4000 and Betty saved \$3500. Adam deposited his money in Bank *A* at an annual rate of 2.4% compounded monthly. Betty deposited her money in Bank *B* at an annual rate of 4% compounded quarterly. Write two functions that represent the value of each account after *t* years if no other deposits or withdrawals are made, where Adam's account value is represented by $A(t)$, and Betty's by $B(t)$. Using technology, determine, to the *nearest tenth of a year*, how long it will take for the two accounts to have the same amount of money in them. Justify your answer.

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

478 On a certain tropical island, there are currently 500 palm trees and 200 flamingos. Suppose the palm tree population is decreasing at an annual rate of 3% per year and the flamingo population is growing at a continuous rate of 2% per year. Write two functions, $P(x)$ and $F(x)$, that represent the number of palm trees and flamingos on this island, respectively, *x* years from now. State the solution to the equation $P(x) = F(x)$, rounded to the *nearest year*. Interpret the meaning of this value within the given context.

479 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature

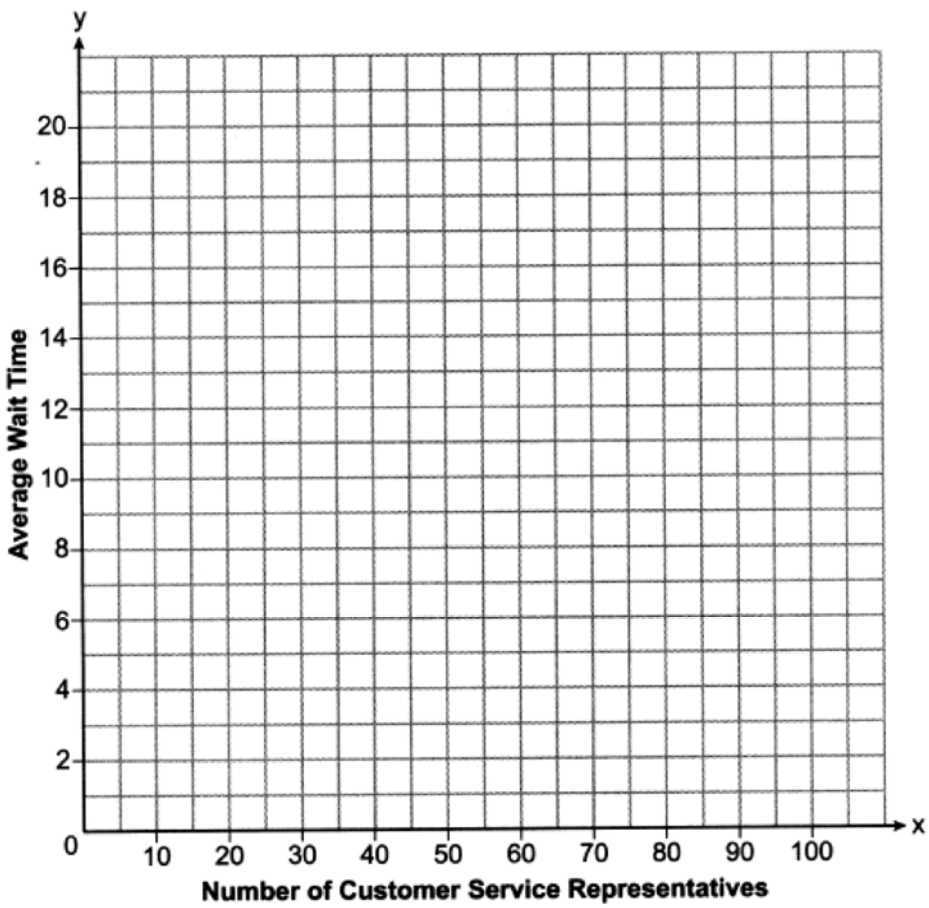
T_R: room temperature

r: rate of cooling of the object

t: time in minutes that the object cools to a temperature, T

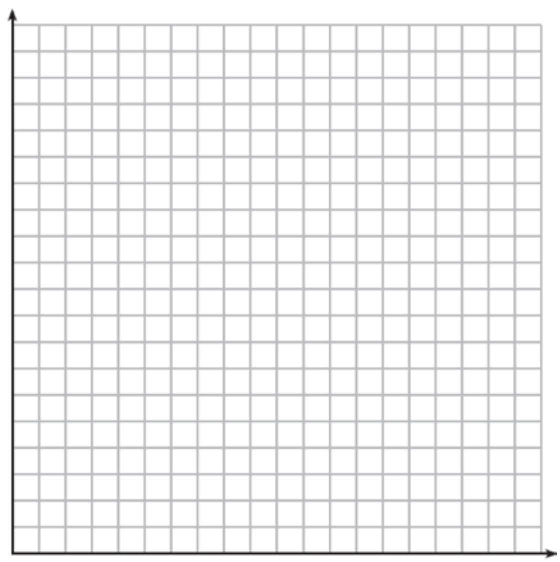
Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, *T*, after *t* minutes. Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes. At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*. The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

480 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer. Graph $A(x)$ and $B(x)$ in the interval $0 \le x \le 100$ on the set of axes below.



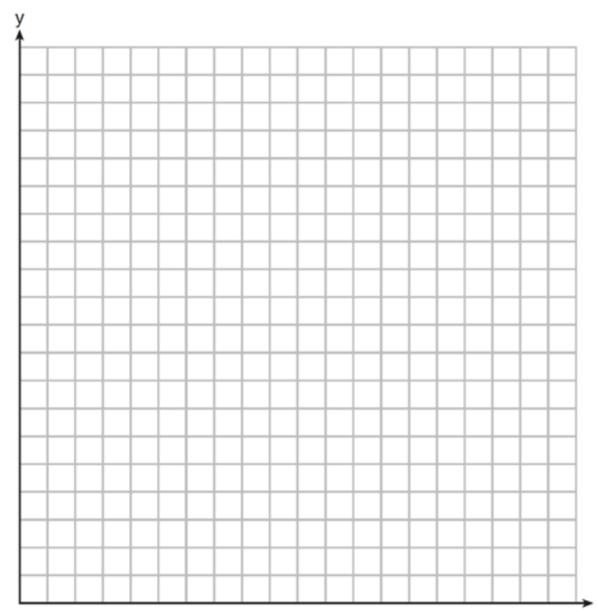
To the *nearest integer*, solve the equation $A(x) = B(x)$. Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

481 The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and t is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and t is the time in years, models the unpaid amount of Zach's loan over time. Graph $V(t)$ and $Z(t)$ over the interval $0 \le t \le 5$, on the set of axes below.



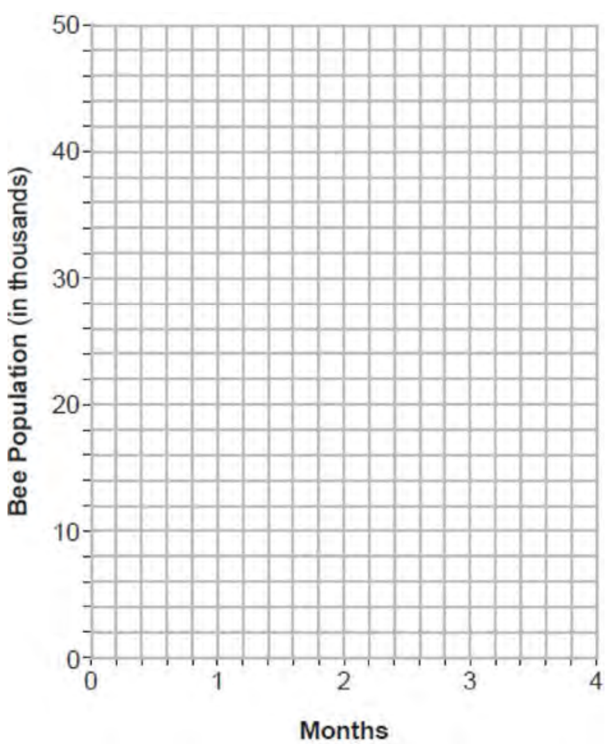
State when $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem. Zach takes out an insurance policy that requires him to pay a \$3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible.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

482 Drugs break down in the human body at different rates and therefore must be prescribed by doctors carefully to prevent complications, such as overdosing. The breakdown of a drug is represented by the function $N(t) = N_0(e)^{-rt}$, where $N(t)$ is the amount left in the body, N_0 is the initial dosage, r is the decay rate, and t is time in hours. Patient A, $A(t)$, is given 800 milligrams of a drug with a decay rate of 0.347. Patient B, $B(t)$, is given 400 milligrams of another drug with a decay rate of 0.231. Write two functions, $A(t)$ and $B(t)$, to represent the breakdown of the respective drug given to each patient. Graph each function on the set of axes below.



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

483 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate. Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months. Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.



State, to the *nearest tenth of a month*, when the colonies will have the same population. Determine algebraically how long it will take, to the *nearest tenth of a month*, for the population in Colony A to triple.

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

1 5, 1
2 –2.41, 0.41
3 –2.41, 5
4 5, only

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

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

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

1 1.1
2 3.7
3 3.9
4 4.3

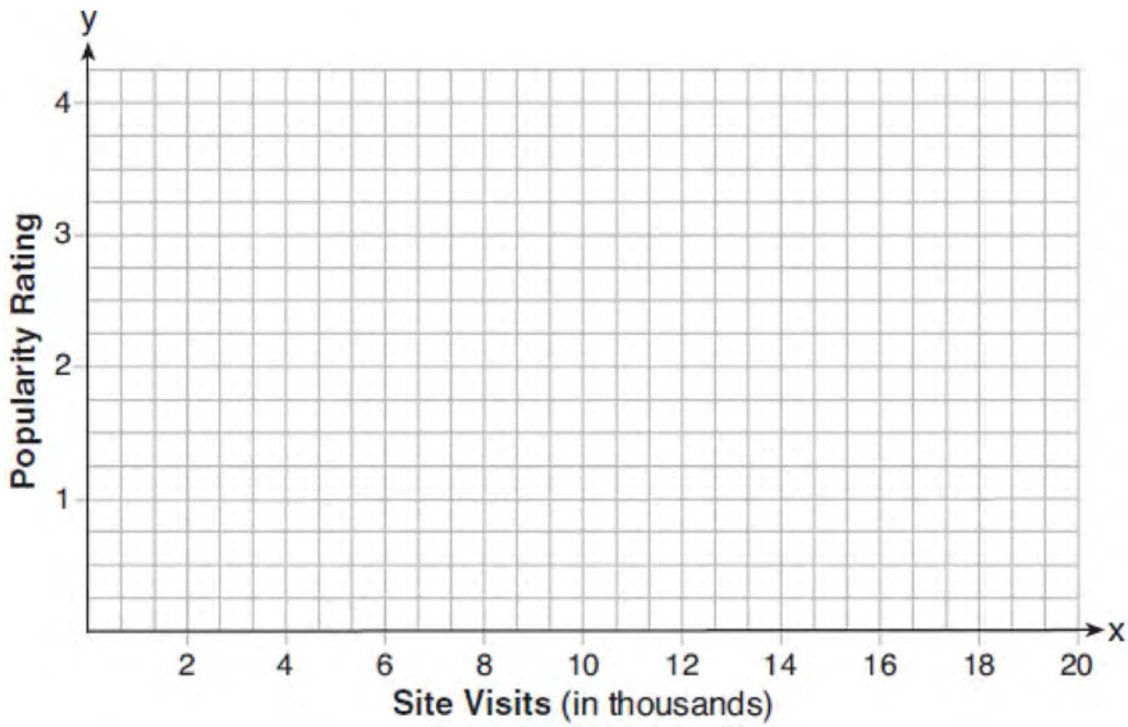
487 If $p(x) = 2\ln(x) - 1$ and $m(x) = \ln(x+6)$, then what is the solution for $p(x) = m(x)$?

1 1.65
2 3.14
3 5.62
4 no solution

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

1 1
2 2
3 3
4 0

489 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating. According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*? Graph $y = P(x)$ on the axes below.



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

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

491 What is the total number of points of intersection of the graphs of the equations $y = e^x$ and $xy = 20$?
1 1
2 2
3 3
4 0

492 Given the functions $f(x) = 2x + \frac{5}{2}$ and $g(x) = \frac{3}{x}$, what are the solutions to $f(x) = g(x)$?
1 $(0.75, 4)$ or $(-2, -1.5)$
2 $x = 0.75$ or $x = -2$
3 $y = -1.5$ or $y = 4$
4 $(-2, 0.75)$

493 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 $g(x) = 2(1.3)^x$?

1 3.2
2 3.9
3 4.0
4 5.6

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

1 $(-0.9, 1.8)$
2 $(-0.9, 1.9)$
3 $(1.4, 3.3)$
4 $(1.4, 3.4)$

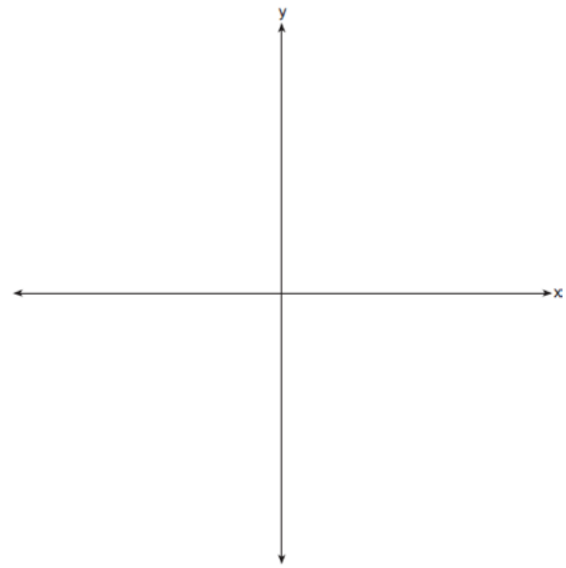
495 Sarah is fighting a sinus infection. Her doctor prescribed a nasal spray and an antibiotic to fight the infection. The active ingredients, in milligrams, remaining in the bloodstream from the nasal spray, $n(t)$, and the antibiotic, $a(t)$, are modeled in the functions below, where t is the time in hours since the medications were taken.

$$n(t) = \frac{t+1}{t+5} + \frac{18}{t^2 + 8t + 15}$$

$$a(t) = \frac{9}{t+3}$$

Determine which drug is made with a greater initial amount of active ingredient. Justify your answer. Sarah's doctor told her to take both drugs at the same time. Determine algebraically the number of hours after taking the medications when both medications will have the same amount of active ingredient remaining in her bloodstream.

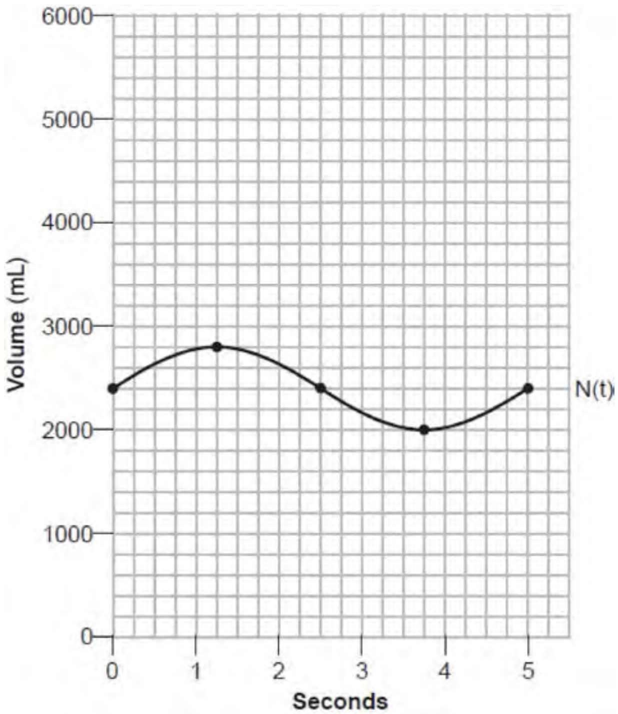
496 Sketch the graphs of $r(x) = \dfrac{1}{x}$ and $a(x) = |x| - 3$ on the set of axes below. Determine, to the *nearest tenth*, the positive solution of $r(x) = a(x)$.



497 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 $g(x) = x^3 - 2x + 1$?

1 −3.6
2 −2.1
3 −1.8
4 1.4

498 The volume of air in an average lung during breathing can be modeled by the graph below.



Using the graph, write an equation for $N(t)$, in the form $N(t) = A\sin(Bt) + C$. That same lung, when engaged in exercise, has a volume that can be modeled by $E(t) = 2000\sin(\pi t) + 3200$, where $E(t)$ is volume in mL and t is time in seconds. Graph *at least one* cycle of $E(t)$ on the same grid as $N(t)$. How many times during the 5-second interval will $N(t) = E(t)$?

FUNCTIONS

F.BF.A.1: OPERATIONS WITH FUNCTIONS

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

1 -18
2 0
3 $-12x$
4 $2x^2 - 12x - 18$

500 Functions f and g are given below.

$$f(x) = \frac{7}{2}x^2 - 5x + 11$$
$$g(x) = 3x^2 - 7x + 25$$

When $2f(x)$ is subtracted from $g(x)$, the result is

1 $4x^2 - 3x - 3$
2 $-4x^2 + 3x + 3$
3 $4x^2 - 17x - 47$
4 $-4x^2 - 17x + 47$

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

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

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

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

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

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

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

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

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

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

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

3 $V(x) = -3x + 36$

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

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

1 $R(n) = 1200(1.002)^n + 100n$

2 $R(n) = 1200(1.002)^{12n} + 100n$

3 $R(n) = 1200(1.002)^n - 100n$

4 $R(n) = 1200(1.002)^{12n} - 100n$

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

1 $0.18x^3 + 6.02x^2 + 91.4x + 180$

2 $0.18x^3 - 5.98x^2 - 91.4x + 180$

3 $-0.18x^3 - 6.02x^2 + 91.4x - 180$

4 $0.18x^3 + 5.98x^2 + 99.4x + 180$

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

1 $0.15x^3 + 0.02x^2 - 28x + 120$

2 $-0.15x^3 - 0.02x^2 + 28x - 120$

3 $-0.15x^3 + 0.01x^2 - 2.01x - 120$

4 $-0.15x^3 + 32x + 120$

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

1 $c(x) = 0.2x^2 - 100x + 300$

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

3 $c(x) = -0.2x^2 + 100x - 300$

4 $c(x) = -0.8x^2 + 400x - 300$

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

1 $c(x) = -14.6x^2 + 470x - 1140$

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

3 $c(x) = 14.6x^2 - 470x + 1140$

4 $c(x) = 14.6x^2 + 730x - 1260$

511 Given: $f(x) = 2x^2 + x - 3$ and $g(x) = x - 1$
Express $f(x) \bullet g(x) - [f(x) + g(x)]$ as a polynomial in standard form.

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

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

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

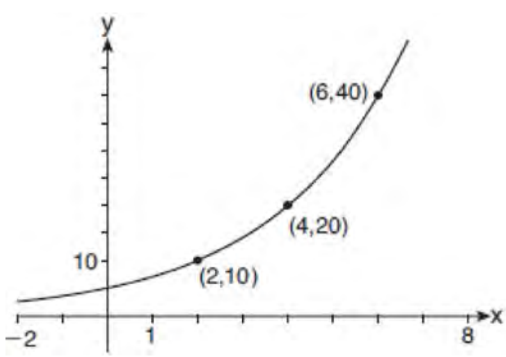
$$C(x) = x^4 - 5x$$

F.LE.A.2: FAMILIES OF FUNCTIONS

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

1 exponential function
2 linear function
3 quadratic function
4 trigonometric function

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



Which expression defines $f(x)$?

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

515 Which table best represents an exponential relationship?

1

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

2

x	y
8	0
4	1
0	2
−4	3
−8	4

3

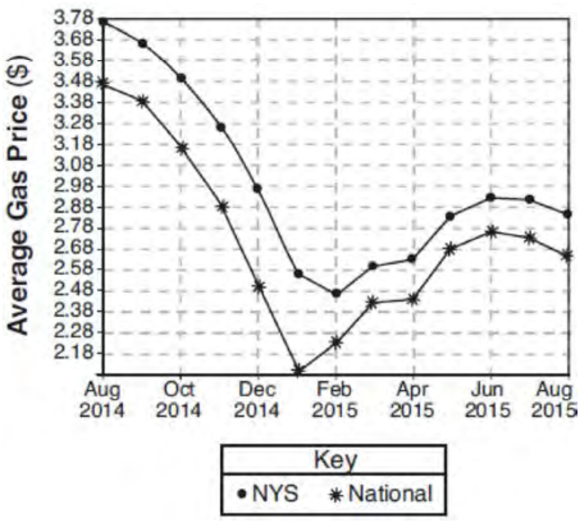
x	y
0	0
1	1
2	4
3	9
4	16

4

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

F.BF.B.3: TRANSFORMATIONS WITH FUNCTIONS

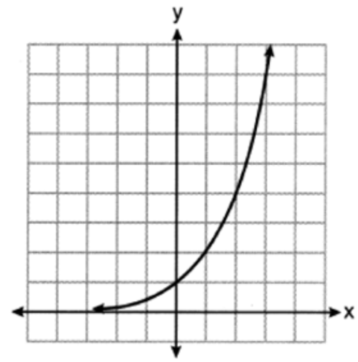
516 The graph below represents national and New York State average gas prices.



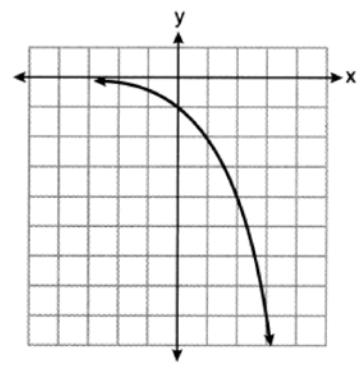
If New York State's gas prices are modeled by $G(x)$ and $C > 0$, which expression best approximates the national average x months from August 2014?

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

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

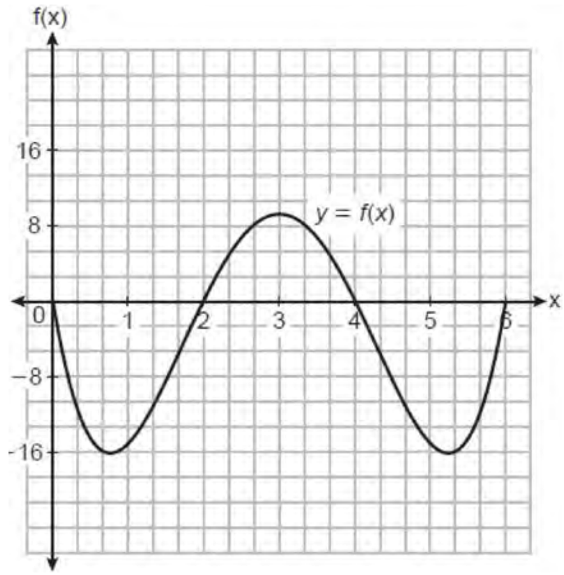


Which equation could be used to represent the graph shown below?



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

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

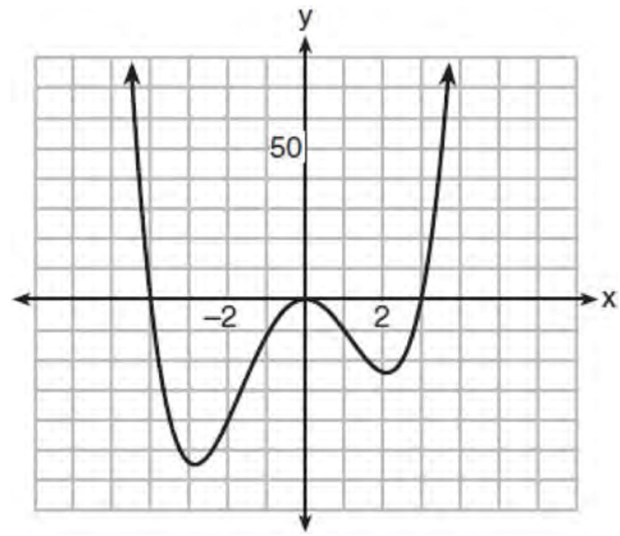


If this trail has a minimum height of 16 feet below sea level, which function(s) could represent a running trail whose minimum height is half of the minimum height of the original trail?

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

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

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

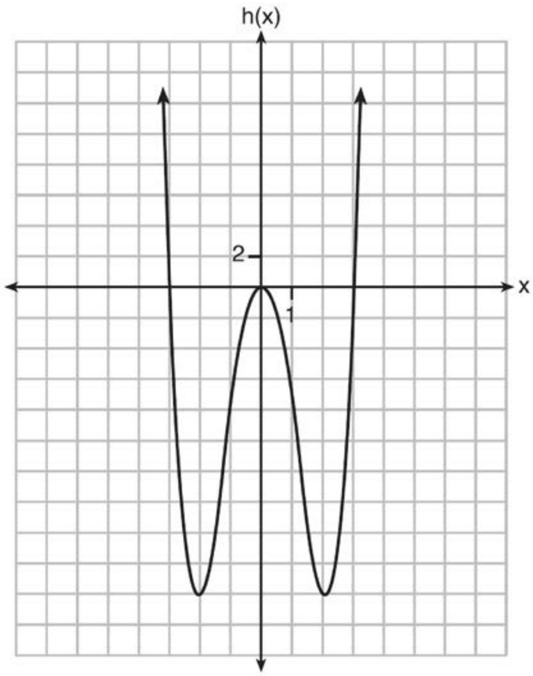


Write an equation for $f(x)$. The function g is formed by translating function f left 2 units. Write an equation for $g(x)$.

F.BF.B.3: EVEN AND ODD FUNCTIONS

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

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



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

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

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

523 Which equation represents an odd function?
1 $y = \sin x$
2 $y = \cos x$
3 $y = (x+1)^3$
4 $y = e^{5x}$

524 If $f(x)$ is an even function, which function must also be even?
1 $f(x-2)$
2 $f(x)+3$
3 $f(x+1)$
4 $f(x+1)+3$

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

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

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

F.BF.B.4: INVERSE OF FUNCTIONS

528 What is the inverse of the function $y = 4x + 5$?
1 $x = \frac{1}{4}y - \frac{5}{4}$
2 $y = \frac{1}{4}x - \frac{5}{4}$
3 $y = 4x - 5$
4 $y = \frac{1}{4x+5}$

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

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

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

3 $f^{-1}(x) = \dfrac{x+4}{12}$

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

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

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

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

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

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

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

1 $g(x) = 2x - 8$

2 $g(x) = 2x - 16$

3 $g(x) = -\dfrac{1}{2}x + 8$

4 $g(x) = -\dfrac{1}{2}x - 16$

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

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

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

3 $f^{-1}(x) = \dfrac{1}{-6(x-2)}$

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

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

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

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

3 $f^{-1}(x) = -\dfrac{1}{6}x + \dfrac{1}{12}$

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

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

1 $f^{-1}(x)$ is a line with slope $\dfrac{5}{2}$.

2 $f^{-1}(x)$ is a line with slope $\dfrac{2}{5}$.

3 $f^{-1}(x)$ passes through the point $(6,-5)$.

4 $f^{-1}(x)$ has a y-intercept at $(0,-4)$.

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

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

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

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

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

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

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

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

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

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

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

538 If $f(x) = \sqrt[3]{x}+4$, then $f^{-1}(x)$ equals
1 $\sqrt[3]{x-4}$
2 $(x-4)^3$
3 $x^3+\frac{1}{4}$
4 $-\sqrt[3]{x}-4$

539 Given $f(x) = x^3-3$ and $f^{-1}(x) = \sqrt[3]{x-3b}$, the value of b is
1 1
2 –1
3 3
4 –3

540 What is the inverse of $f(x) = x^3-2$?
1 $f^{-1}(x) = \sqrt[3]{x}+2$
2 $f^{-1}(x) = \pm\sqrt[3]{x}+2$
3 $f^{-1}(x) = \sqrt[3]{x+2}$
4 $f^{-1}(x) = \pm\sqrt[3]{x+2}$

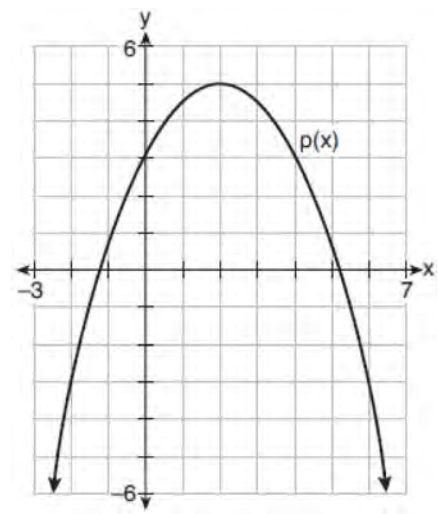
541 For the function $f(x) = (x-3)^3+1$, find $f^{-1}(x)$.

542 What is the inverse of $f(x) = \frac{x}{x+2}$, where $x \neq -2$?
1 $f^{-1}(x) = \frac{2x}{x-1}$
2 $f^{-1}(x) = \frac{-2x}{x-1}$
3 $f^{-1}(x) = \frac{x}{x-2}$
4 $f^{-1}(x) = \frac{-x}{x-2}$

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

F.IF.C.9: COMPARING FUNCTIONS

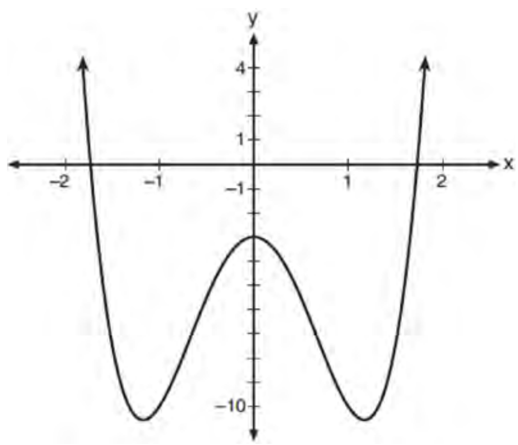
544 Consider $f(x) = 4x^2+6x-3$, and $p(x)$ defined by the graph below.



The difference between the values of the maximum of p and minimum of f is
1 0.25
2 1.25
3 3.25
4 10.25

545 Which function has the greatest y-intercept?
1 $f(x) = 4\sin(2x)$
2 $g(x) = 3x^4+2x^3+7$
3 $h(x) = 5e^{2x}+3$
4 $j(x) = 6\log_2(3x+4)$

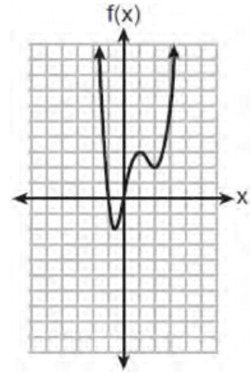
546 Consider the function $p(x) = 3x^3 + x^2 - 5x$ and the graph of $y = m(x)$ below.

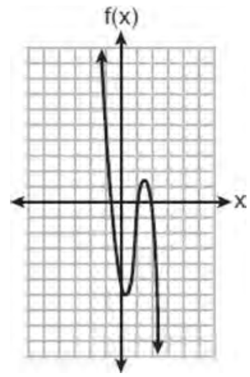


Which statement is true?

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

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

1 

2 

3 $f(x) = 5(4)^{-x}$
4 $f(x) = -\log_5(-x)$

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

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

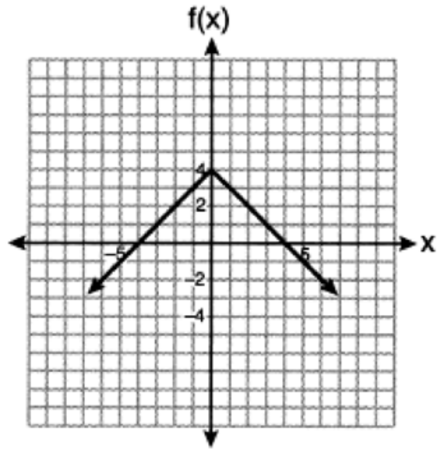
$$g(x) = (x - 0.5)(x + 4)(x - 2)$$

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

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

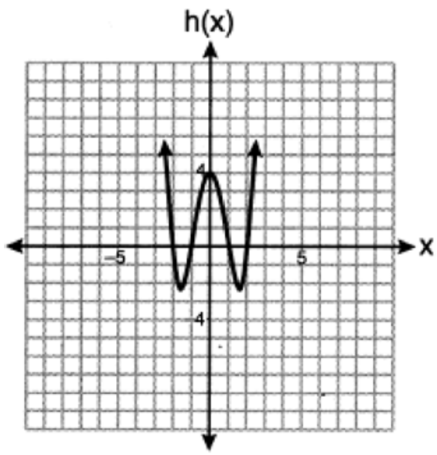
1 $f(x)$ and $j(x)$ have a maximum y-value of 3.
2 $f(x)$, $h(x)$, and $j(x)$ have one y-intercept.
3 $g(x)$ and $j(x)$ have the same end behavior as $x \to -\infty$.
4 $g(x)$, $h(x)$, and $j(x)$ have rational zeros.

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



1

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



3

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

550 The *x*-value of which function's *x*-intercept is larger, *f* or *h*? Justify your answer.

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

x	h(x)
–1	6
0	4
1	2
2	0
3	–2

551 Consider the function $h(x) = 2\sin(3x) + 1$ and the function q represented in the table below.

x	$q(x)$
–2	–8
–1	0
0	0
1	–2
2	0

Determine which function has the *smaller* minimum value for the domain $[-2,2]$. Justify your answer.

SEQUENCES & SERIES

F.IF.A.3: SEQUENCES

552 Consider the following patterns:

I. $16, -12, 9, -6.75, \dots$

II. $1, 4, 9, 16, \dots$

III. $6, 18, 30, 42, \dots$

IV. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \dots$

Which pattern is geometric?

1 I
2 II
3 III
4 IV

553 Which situation could be modeled using a geometric sequence?

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

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

1 8
2 8.5
3 9.2
4 10

555 The recursive formula to describe a sequence is shown below.

$$a_1 = 3$$

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

State the first four terms of this sequence. Can this sequence be represented using an explicit geometric formula? Justify your answer.

F.BF.A.2: SEQUENCES

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

1 25
2 34
3 36
4 42

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

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

558 The eighth and tenth terms of a sequence are 64 and 100. If the sequence is either arithmetic or geometric, the ninth term can *not* be
1 –82
2 –80
3 80
4 82

559 Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book. Suppose the total amount Simon owes when the book is *n* days late can be determined by an arithmetic sequence. Determine a formula for a_n, the *n*th term of this sequence. Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

560 At her job, Pat earns \$25,000 the first year and receives a raise of \$1000 each year. The explicit formula for the *n*th term of this sequence is $a_n = 25,000 + (n-1)1000$. Which rule best represents the equivalent recursive formula?
1 $a_n = 24,000 + 1000n$
2 $a_n = 25,000 + 1000n$
3 $a_1 = 25,000,\ a_n = a_{n-1} + 1000$
4 $a_1 = 25,000,\ a_n = a_{n+1} + 1000$

561 Savannah just got contact lenses. Her doctor said she can wear them 2 hours the first day, and can then increase the length of time by 30 minutes each day. If this pattern continues, which formula would *not* be appropriate to determine the length of time, in either minutes or hours, she could wear her contact lenses on the *n*th day?
1 $a_1 = 120$
$a_n = a_{n-1} + 30$
2 $a_n = 90 + 30n$
3 $a_1 = 2$
$a_n = a_{n-1} + 0.5$
4 $a_n = 2.5 + 0.5n$

562 The sequence $a_1 = 6,\ a_n = 3a_{n-1}$ can also be written as
1 $a_n = 6 \cdot 3^n$
2 $a_n = 6 \cdot 3^{n+1}$
3 $a_n = 2 \cdot 3^n$
4 $a_n = 2 \cdot 3^{n+1}$

563 A recursive formula for the sequence $40, 30, 22.5, \dots$ is
1 $g_n = 40\left(\frac{3}{4}\right)^n$
2 $g_1 = 40$
$g_n = g_{n-1} - 10$
3 $g_n = 40\left(\frac{3}{4}\right)^{n-1}$
4 $g_1 = 40$
$g_n = \frac{3}{4} g_{n-1}$

564 A recursive formula for the sequence $64, 48, 36, \dots$ is
1 $a_n = 64(0.75)^{n-1}$
2 $a_1 = 64$
$a_n = a_{n-1} - 16$
3 $a_n = 64 + (n-1)(-16)$
4 $a_1 = 64$
$a_n = 0.75a_{n-1}$

565 A recursive formula for the sequence $18, 9, 4.5, \dots$ is
1 $g_1 = 18$
$g_n = \frac{1}{2} g_{n-1}$
2 $g_n = 18\left(\frac{1}{2}\right)^{n-1}$
3 $g_1 = 18$
$g_n = 2g_{n-1}$
4 $g_n = 18(2)^{n-1}$

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

1 $A = 5000(0.035)^n$

2 $a_0 = 5000$
$a_n = a_{n-1}(0.035)$

3 $A = 5000(1.035)^n$

4 $a_0 = 5000$
$a_n = a_{n-1}(1.035)$

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

1 $j_n = 250{,}000(1.00375)^{n-1}$

2 $j_n = 250{,}000 + 937^{(n-1)}$

3 $j_1 = 250{,}000$
$j_n = 1.00375j_{n-1}$

4 $j_1 = 250{,}000$
$j_n = j_{n-1} + 937$

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

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

2 $P_0 = 19{,}378{,}000$
$P_t = 19{,}378{,}000 + 1.015P_{t-1}$

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

4 $P_0 = 19{,}378{,}000$
$P_t = 1.015P_{t-1}$

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

1 $a_n = 75{,}000(0.08)^n$

2 $a_0 = 75{,}000$
$a_n = (0.92)^n$

3 $a_n = 75{,}000(1.08)^n$

4 $a_0 = 75{,}000$
$a_n = 0.92(a_{n-1})$

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

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

How can this sequence best be modeled recursively?

1 $m_1 = 2000$
$m_n = m_{n-1} - 320$

2 $m_n = 2000(0.84)^{n-1}$

3 $m_1 = 2000$
$m_n = (0.84)m_{n-1}$

4 $m_n = 2000(0.84)^{n+1}$

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

1 $a_1 = 150$

$a_n = a_{n-1}(0.2) + 80$

2 $a_1 = 150$

$a_n = a_{n-1}(0.8) + 80$

3 $a_n = 150(0.2)^n + 80$

4 $a_n = 150(0.8)^n + 80$

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

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

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

3 $a_0 = 1000$

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

4 $a_0 = 1000$

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

573 The formula below can be used to model which scenario?

$$a_1 = 3000$$

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

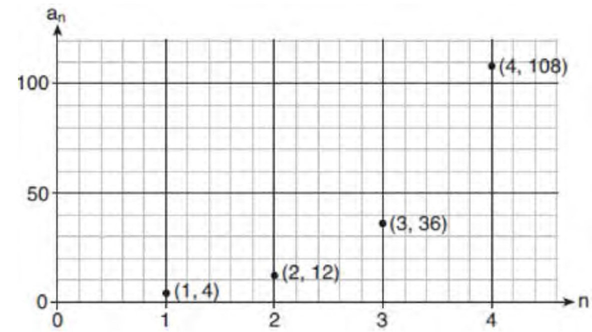
1 The first row of a stadium has 3000 seats, and each row thereafter has 80 more seats than the row in front of it.

2 The last row of a stadium has 3000 seats, and each row before it has 80 fewer seats than the row behind it.

3 A bank account starts with a deposit of $3000, and each year it grows by 80%.

4 The initial value of a specialty toy is $3000, and its value each of the following years is 20% less.

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



575 Write a recursive formula for the sequence $6, 9, 13.5, 20.25, \dots$

576 Write a recursive formula for the sequence $189, 63, 21, 7, \dots$.

577 Write a recursive formula for the sequence $8, 20, 50, 125, 312.5, \dots$

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

579 The explicit formula $a_n = 6 + 6n$ represents the number of seats in each row in a movie theater, where n represents the row number. Rewrite this formula in recursive form.

580 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$

$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$. Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910. According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

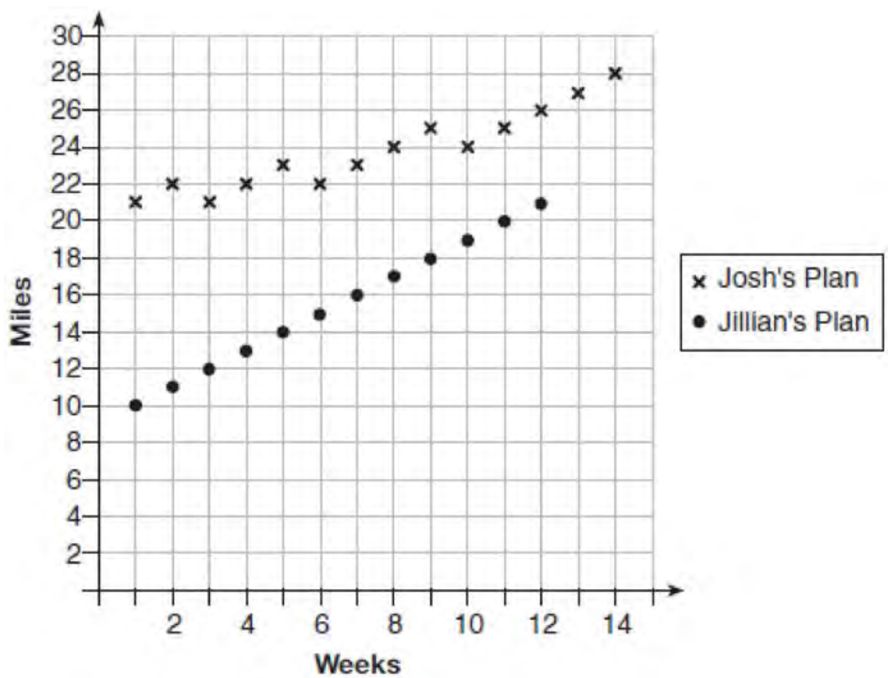
581 Write an explicit formula for a_n, the nth term of the recursively defined sequence below.

$$a_1 = x + 1$$

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

For what values of x would $a_n = 0$ when $n > 1$?

582 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer. Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose. Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

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

F.BF.B.6: SIGMA NOTATION

584 Kristin wants to increase her running endurance. According to experts, a gradual mileage increase of 10% per week can reduce the risk of injury. If Kristin runs 8 miles in week one, which expression can help her find the total number of miles she will have run over the course of her 6-week training program?
1 $\sum_{n=1}^{6} 8(1.10)^{n-1}$
2 $\sum_{n=1}^{6} 8(1.10)^{n}$
3 $\dfrac{8-8(1.10)^6}{0.90}$
4 $\dfrac{8-8(0.10)^n}{1.10}$

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

Year	**Amount Saved** (in dollars)
1	59,000
2	64,900
3	71,390
4	78,529
5	86,381.9

Which expression determines the total amount of money saved by the company over 5 years?
1 $\dfrac{59,000-59,000(1.1)^5}{1-1.1}$
2 $\dfrac{59,000-59,000(0.1)^5}{1-0.1}$
3 $\sum_{n=1}^{5} 59,000(1.1)^n$
4 $\sum_{n=1}^{5} 59,000(0.1)^{n-1}$

F.BF.B.7: SERIES

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

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

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

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

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

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

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

587 Beginning July 1, 2019, Michelle deposited \$250 into an account that yields 0.15% each month. She continued to make \$250 deposits into this account on the first of each month for 3 years. Which expression represents the amount of money that was in the account after her last deposit was made on June 1, 2022?

1 $250(1.0015)^3$

2 $250(1.0015)^{36}$

3 $\dfrac{250-250(1.0015)^3}{1-1.0015}$

4 $\dfrac{250-250(1.0015)^{36}}{1-1.0015}$

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

1 $S_{21}=500(1.04)^{21}$

2 $S_{21}=\dfrac{500(1-1.04^{21})}{1-1.04}$

3 $S_{21}=500(1.04)^{20}+500$

4 $S_{21}=\dfrac{500(1-0.04^{21})}{1-1.04}$

589 Jasmine decides to put \$100 in a savings account each month. The account pays 3% annual interest, compounded monthly. How much money, S, will Jasmine have after one year?

1 $S=100(1.03)^{12}$

2 $S=\dfrac{100-100(1.0025)^{12}}{1-1.0025}$

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

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

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

1 -610

2 -59

3 1,743,392,200

4 2,324,522,934

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

1 236,192

2 708,584

3 2,125,760

4 6,377,288

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

593 Jay is training for a bike race over fifteen weeks. At the end of the first week, he has ridden ten miles, and he is planning to increase his weekly distance by nine percent each week. Approximately how many miles total will he have ridden from the beginning of his training to the end of the fifteenth week?
1 10.989
2 33.417
3 163.5
4 293.609

594 The crew aboard a small fishing boat caught 350 pounds of fish on Monday. From that Monday through the end of the week on Friday, the weight of the fish caught increased 15% per day. The total weight, in pounds, of fish caught is approximately
1 411
2 612
3 1748
4 2360

595 A 7-year lease for office space states that the annual rent is \$85,000 for the first year and will increase by 6% each additional year of the lease. What will the total rent expense be for the entire 7-year lease?
1 \$42,809.63
2 \$90,425.53
3 \$595,000.00
4 \$713,476.20

596 A research assistant receives a first year salary of \$90,000 and a 2% annual raise throughout the first ten years of employment. In total, how much money will be earned over the first ten years, to the *nearest dollar*?
1 \$91,837
2 \$109,709
3 \$877,917
4 \$985,475

597 Brian deposited 1 cent into an empty non-interest bearing bank account on the first day of the month. He then additionally deposited 3 cents on the second day, 9 cents on the third day, and 27 cents on the fourth day. What would be the total amount of money in the account at the end of the 20th day if the pattern continued?
1 \$11,622,614.67
2 \$17,433,922.00
3 \$116,226,146.80
4 \$1,743,392,200.00

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

599 The initial push of a child on a swing causes the swing to travel a total of 6 feet. Each successive swing travels 80% of the distance of the previous swing. Determine the total distance, to the *nearest hundredth of a foot*, a child travels in the first five swings.

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

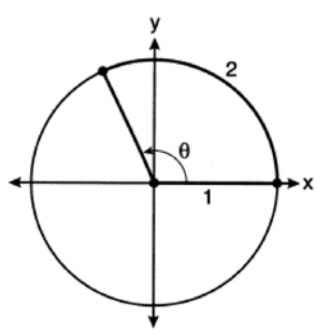
601 Sonja is cutting wire to construct a mobile. She cuts 100 inches for the first piece, 80 inches for the second piece, and 64 inches for the third piece. Assuming this pattern continues, write an explicit equation for a_n, the length in inches of the nth piece. Sonja only has 40 feet of wire to use for the project and wants to cut 20 pieces total for the mobile using her pattern. Will she have enough wire? Justify your answer.

602 Alexa earns $33,000 in her first year of teaching and earns a 4% increase in each successive year. Write a geometric series formula, S_n, for Alexa's total earnings over n years. Use this formula to find Alexa's total earnings for her first 15 years of teaching, to the *nearest cent*.

TRIGONOMETRY

F.TF.A.1: UNIT CIRCLE

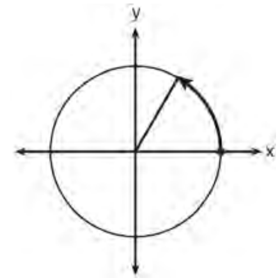
603 An angle, θ, is rotated counterclockwise on the unit circle, with its terminal side in the second quadrant, as shown in the diagram below.

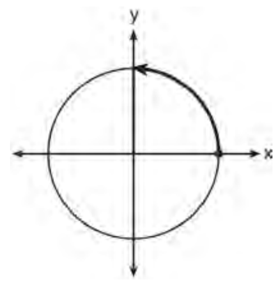


Which value represents the radian measure of angle θ?

1 1
2 2
3 65.4
4 114.6

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

1


2


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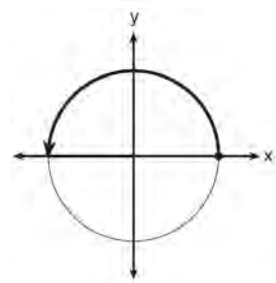

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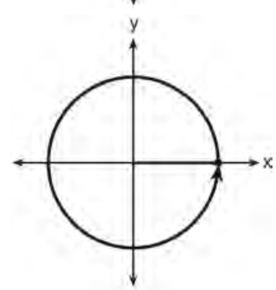
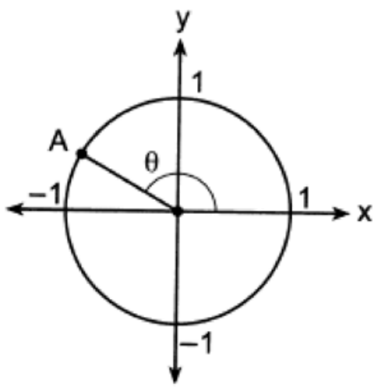


F.TF.A.2: UNIT CIRCLE

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



What is m$\angle\theta$?
1 30º
2 120º
3 135º
4 150º

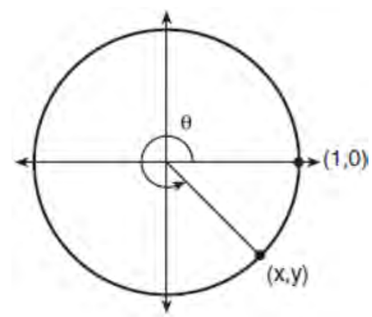
606 The terminal side of θ, an angle in standard position, intersects the unit circle at $P\left(-\frac{1}{3},-\frac{\sqrt{8}}{3}\right)$.

What is the value of sec θ?
1 –3
2 $-\frac{3\sqrt{8}}{8}$
3 $-\frac{1}{3}$
4 $-\frac{\sqrt{8}}{3}$

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

F.TF.A.2: RECIPROCAL TRIGONOMETRIC RELATIONSHIPS

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



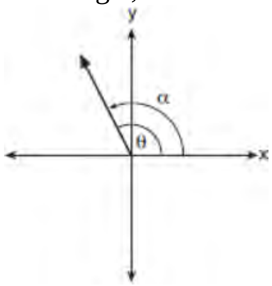
F.TF.A.2: FINDING THE TERMINAL SIDE OF AN ANGLE

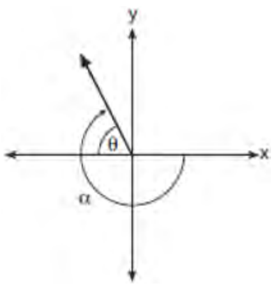
609 Natalia's teacher has given her the following information about angle θ.
- $\pi<\theta<2\pi$
- $\cos\theta=\frac{\sqrt{3}}{4}$

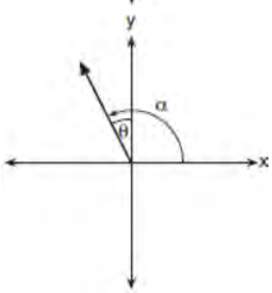
Explain how Natalia can determine if the value of $\tan\theta$ is positive or negative.

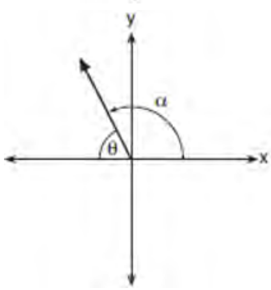
F.TF.A.2: REFERENCE ANGLES

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

1


2


3


4


F.TF.A.2: DETERMINING TRIGONOMETRIC FUNCTIONS

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

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

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

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

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

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

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

1 $\frac{2}{3}$

2 $\frac{3}{2}$

3 $-\frac{2}{\sqrt{13}}$

4 $-\frac{3}{\sqrt{13}}$

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

1 $\sec\theta > 0$ and $\tan\theta > 0$

2 $\sec\theta < 0$ and $\tan\theta < 0$

3 $\sec\theta > 0$ and $\tan\theta < 0$

4 $\sec\theta < 0$ and $\tan\theta > 0$

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

F.TF.C.8: DETERMINING TRIGONOMETRIC FUNCTIONS

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

1 $-\frac{24}{25}$

2 $-\frac{24}{7}$

3 $\frac{24}{25}$

4 $\frac{24}{7}$

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

1 $-\frac{7}{24}$

2 $-\frac{24}{7}$

3 $\frac{7}{24}$

4 $\frac{24}{7}$

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

1 $-\frac{\sqrt{7}}{4}$

2 $\frac{\sqrt{7}}{4}$

3 $-\frac{5}{4}$

4 $\frac{5}{4}$

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

1 $\frac{5+\sqrt{2}}{5}$

2 $\frac{\sqrt{23}}{5}$

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

4 $\frac{\sqrt{35}}{5}$

621 If $\cos A = \frac{\sqrt{5}}{3}$ and $\tan A < 0$, what is the value of $\sin A$?
1 $\frac{2}{3}$
2 $-\frac{\sqrt{5}}{3}$
3 $-\frac{2}{3}$
4 $\frac{3}{\sqrt{5}}$

622 What is the value of $\tan\theta$ when $\sin\theta = \frac{2}{5}$ and θ is in quadrant II?
1 $\frac{-\sqrt{21}}{5}$
2 $\frac{-\sqrt{21}}{2}$
3 $\frac{-2}{\sqrt{21}}$
4 $\frac{2}{\sqrt{21}}$

623 Given $\tan\theta = -\frac{4}{3}$ where $\frac{\pi}{2} < \theta < \pi$, what is the value of $\sec\theta$?
1 $-\frac{5}{3}$
2 $-\frac{3}{5}$
3 $\frac{4}{5}$
4 $\frac{5}{3}$

624 Using the identity $\sin^2\theta + \cos^2\theta = 1$, find the value of $\tan\theta$, to the *nearest hundredth*, if $\cos\theta$ is –0.7 and θ is in Quadrant II.

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

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

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

F.TF.C.8: PROVING TRIGONOMETRIC IDENTITIES

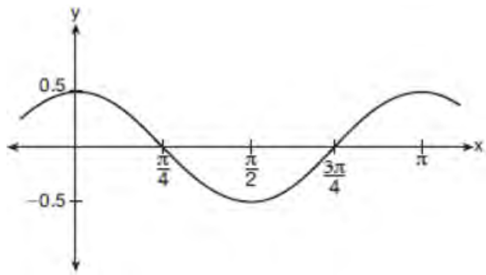
628 If $\sin^2(32°) + \cos^2(M) = 1$, then M equals
1 32°
2 58°
3 68°
4 72°

F.TF.B.5: MODELING TRIGONOMETRIC FUNCTIONS

629 Which function's graph has a period of 8 and reaches a maximum height of 1 if at least one full period is graphed?
1 $y = -4\cos\left(\frac{\pi}{4}x\right) - 3$
2 $y = -4\cos\left(\frac{\pi}{4}x\right) + 5$
3 $y = -4\cos(8x) - 3$
4 $y = -4\cos(8x) + 5$

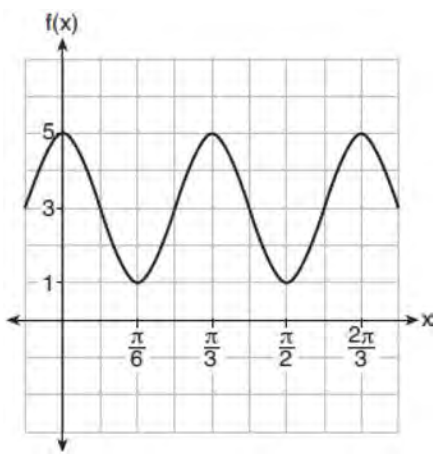
630 The voltage used by most households can be modeled by a sine function. The maximum voltage is 120 volts, and there are 60 cycles *every second*. Which equation best represents the value of the voltage as it flows through the electric wires, where t is time in seconds?
1 $V = 120\sin(t)$
2 $V = 120\sin(60t)$
3 $V = 120\sin(60\pi t)$
4 $V = 120\sin(120\pi t)$

631 Which equation is represented by the graph shown below?



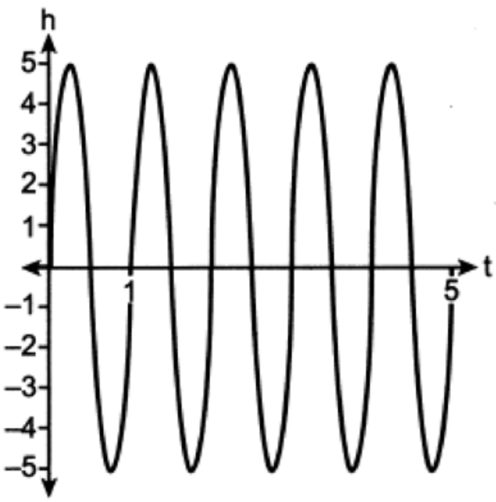
1 $y = \frac{1}{2}\cos 2x$
2 $y = \cos x$
3 $y = \frac{1}{2}\cos x$
4 $y = 2\cos\frac{1}{2}x$

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



What are the values of a, b, and c?
1 $a = 2, b = 6, c = 3$
2 $a = 2, b = 3, c = 1$
3 $a = 4, b = 6, c = 5$
4 $a = 4, b = \frac{\pi}{3}, c = 3$

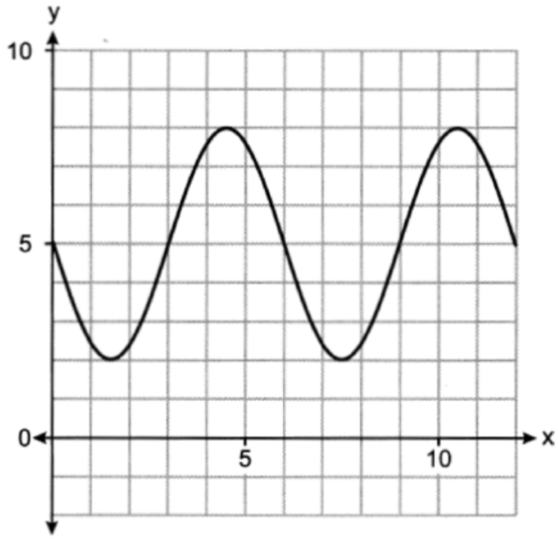
633 A cyclist pedals a bike at a rate of 60 revolutions per minute. The height, h, of a pedal at time t, in seconds, is plotted below.



The graph can be modeled by the function $h(t) = 5\sin(kt)$, where k is equal to
1 1
2 2π
3 60
4 $\frac{\pi}{30}$

Algebra II Regents Exam Questions by State Standard: Topic

634 Which equation is graphed in the diagram below?



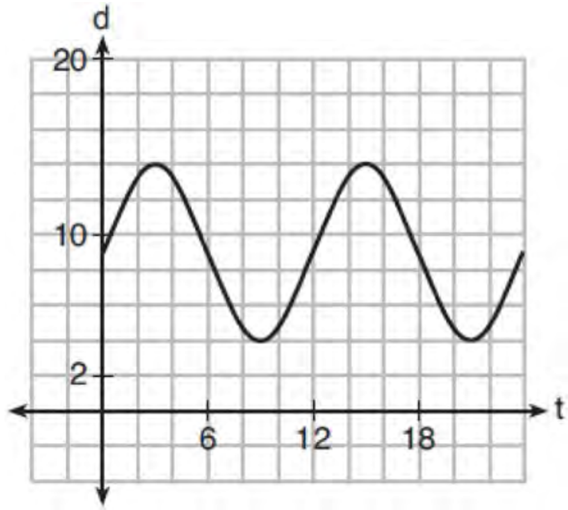
1 $y = -3\sin\left(\frac{\pi}{3}x\right) + 5$

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

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

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

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



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

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

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

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

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

F.IF.B.4: GRAPHING TRIGONOMETRIC FUNCTIONS

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

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

637 Given the parent function $p(x) = \cos x$, which phrase best describes the transformation used to obtain the graph of $g(x) = \cos(x + a) - b$, if a and b are positive constants?

1 right a units, up b units
2 right a units, down b units
3 left a units, up b units
4 left a units, down b units

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

1 68
2 74
3 77
4 81

639 The hours of daylight, y, in Utica in days, x, from January 1, 2013 can be modeled by the equation $y = 3.06\sin(0.017x - 1.40) + 12.23$. How many hours of daylight, to the *nearest tenth*, does this model predict for February 14, 2013?

1 9.4
2 10.4
3 12.1
4 12.2

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

1 150
2 70
3 10
4 0

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

1 $[-23, 23]$
2 $[33, 79]$
3 $[-23, 56]$
4 $[-79, 33]$

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

1 decrease from 1 to 0
2 decrease from 0 to −1
3 increase from −1 to 0
4 increase from 0 to 1

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

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

644 Given $p(\theta) = 3\sin\left(\frac{1}{2}\theta\right)$ on the interval $-\pi < \theta < \pi$, the function p
1 decreases, then increases
2 increases, then decreases
3 decreases throughout the interval
4 increases throughout the interval

645 As x increases from 0 to $\frac{\pi}{2}$, the graph of the equation $y = 2\tan x$ will
1 increase from 0 to 2
2 decrease from 0 to –2
3 increase without limit
4 decrease without limit

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

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

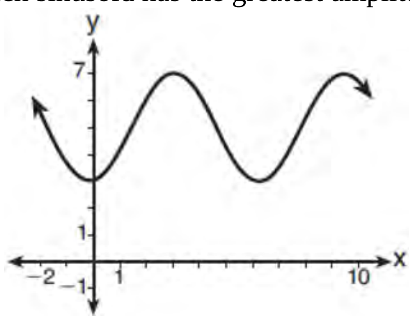
648 The function $d(t) = 2\cos\left(\frac{\pi}{6}t\right) + 5$ models the water depth, in feet, at a location in a bay, t hours since the last high tide. Determine the *minimum* water depth of the location, in feet, and justify your answer.

649 A person's lung capacity can be modeled by the function $C(t) = 250\sin\left(\frac{2\pi}{5}t\right) + 2450$, where $C(t)$ represents the volume in mL present in the lungs after t seconds. State the maximum value of this function over one full cycle, and explain what this value represents.

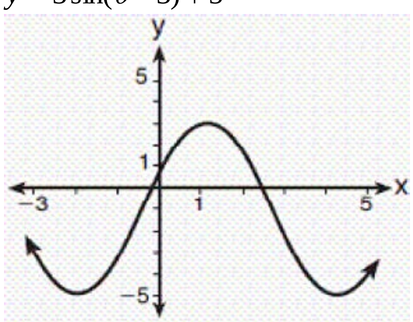
650 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t)=12\cos\left(\frac{\pi}{3}t\right)+8$, where t represents the number of seconds since the measurements began. Determine the average rate of change, in cm/sec, of the piston's height on the interval $1\le t\le 2$. At what value(s) of t, to the *nearest tenth of a second*, does $h(t)=0$ in the interval $1\le t\le 5$? Justify your answer.

F.IF.C.7: GRAPHING TRIGONOMETRIC FUNCTIONS

651 Which sinusoid has the greatest amplitude?

1 

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

3 

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

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

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

Using this function, the amplitude of the tide is

1 $\frac{\pi}{6}$
2 4.8
3 3
4 5.1

653 On July 21, 2016, the water level in Puget Sound, WA reached a high of 10.1 ft at 6 a.m. and a low of –2 ft at 12:30 p.m. Across the country in Long Island, NY, Shinnecock Bay's water level reached a high of 2.5 ft at 10:42 p.m. and a low of –0.1 ft at 5:31 a.m. The water levels of both locations are affected by the tides and can be modeled by sinusoidal functions. Determine the difference in amplitudes, in feet, for these two locations.

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

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

655 The height above ground for a person riding a Ferris wheel after t seconds is modeled by $h(t)=150\sin\left(\frac{\pi}{45}t+67.5\right)+160$ feet. How many seconds does it take to go from the bottom of the wheel to the top of the wheel?

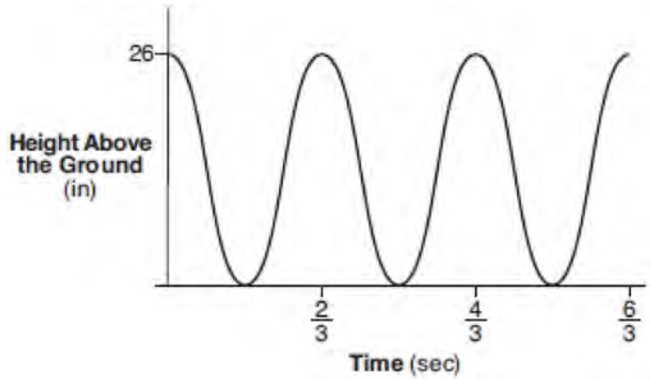
1 10
2 45
3 90
4 150

656 The graph of which function has a period of 3?

1 $y=-7\sin\left(\frac{2\pi}{3}x\right)-5$
2 $y=-7\sin\left(\frac{3\pi}{2}x\right)+9$
3 $y=-7\sin(3x)-5$
4 $y=3\sin(\pi x)+9$

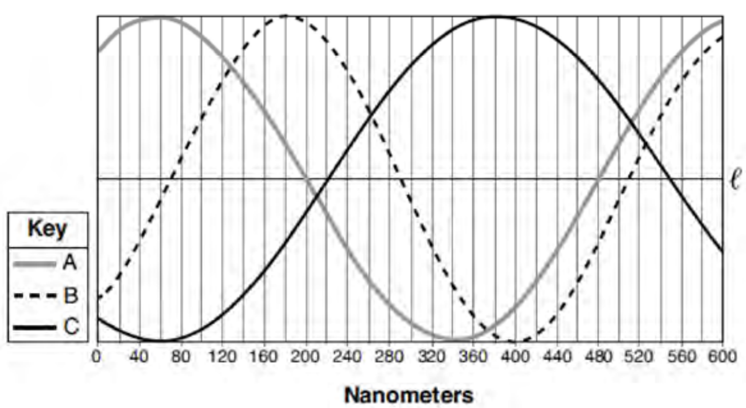
657 The height, above ground, of a Ferris wheel car can be modeled by the function $h(t)=-103.5\cos\left(\frac{2\pi t}{5}\right)+108.5$ where h is measured in feet and t is measured in minutes. State the period of the function and describe what the period represents in this context.

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



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

659 Visible light can be represented by sinusoidal waves. Three visible light waves are shown in the graph below. The midline of each wave is labeled ℓ.



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

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

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

661 Tides are a periodic rise and fall of ocean water. On a typical day at a seaport, to predict the time of the next high tide, the most important value to have would be the

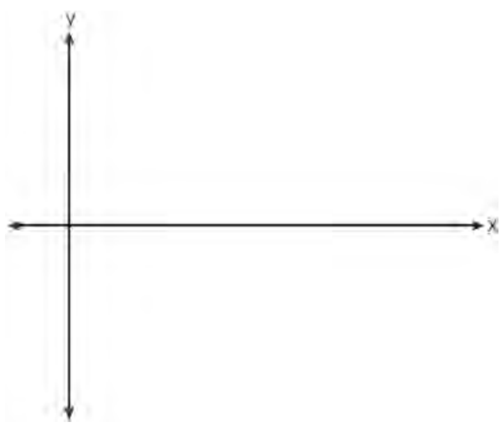
1 time between consecutive low tides
2 time when the tide height is 20 feet
3 average depth of water over a 24-hour period
4 difference between the water heights at low and high tide

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

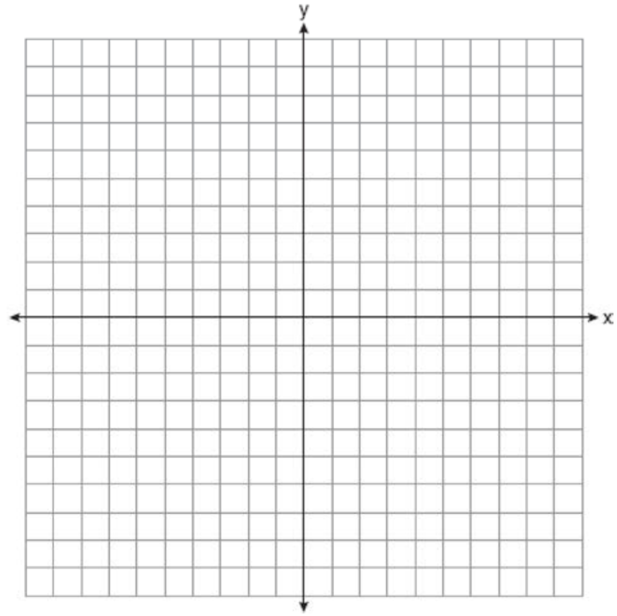
1 amplitude
2 horizontal shift
3 period
4 midline

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

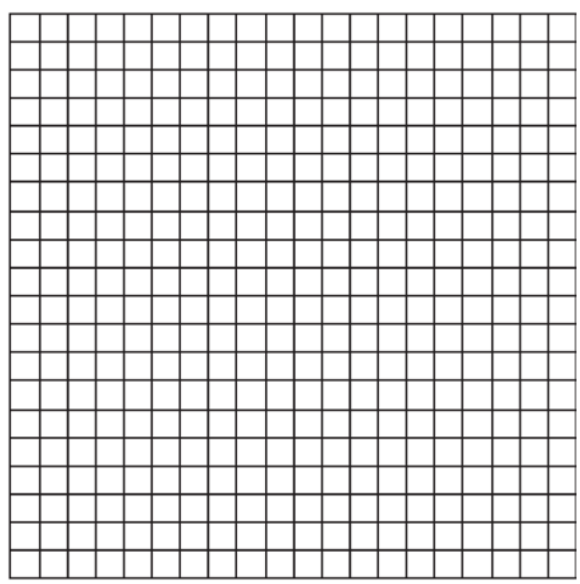
664 On the coordinate plane below, sketch *at least one cycle* of a cosine function with a midline at $y = -2$, an amplitude of 3, and a period of $\frac{\pi}{2}$.



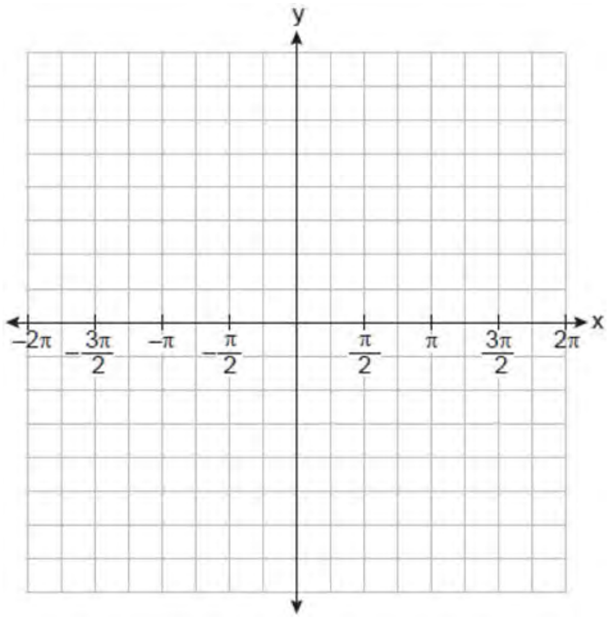
665 On the axes below, graph *one* cycle of a cosine function with amplitude 3, period $\frac{\pi}{2}$, midline $y = -1$, and passing through the point $(0,2)$.



666 Write an equation for a sine function with an amplitude of 2 and a period of $\frac{\pi}{2}$. On the grid below, sketch the graph of the equation in the interval 0 to 2π.

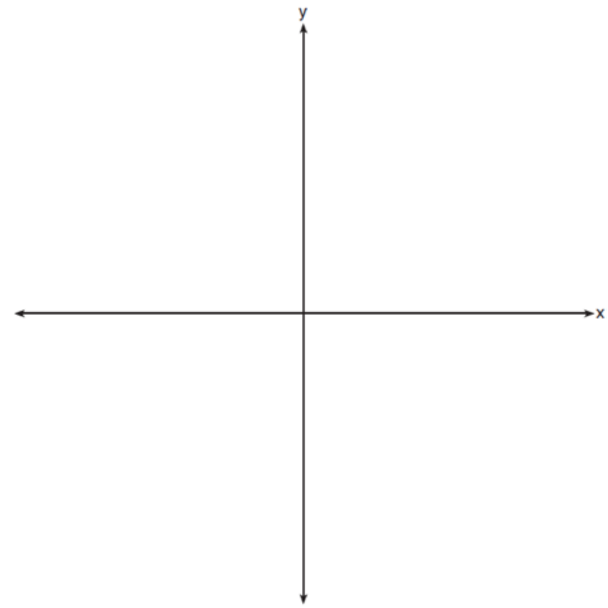


667 On the graph below, draw at least one complete cycle of a sine graph passing through point $(0,2)$ that has an amplitude of 3, a period of π, and a midline at $y = 2$.



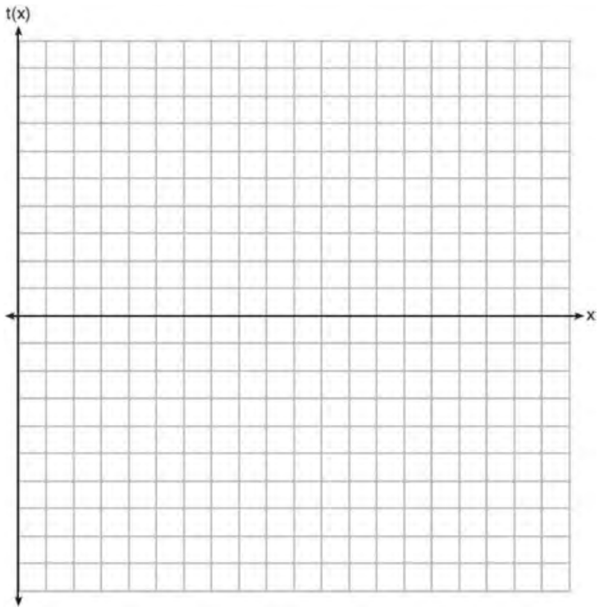
Based on your graph, state an interval in which the graph is increasing.

668 a) On the axes below, sketch *at least one* cycle of a sine curve with an amplitude of 2, a midline at $y = -\frac{3}{2}$, and a period of 2π.

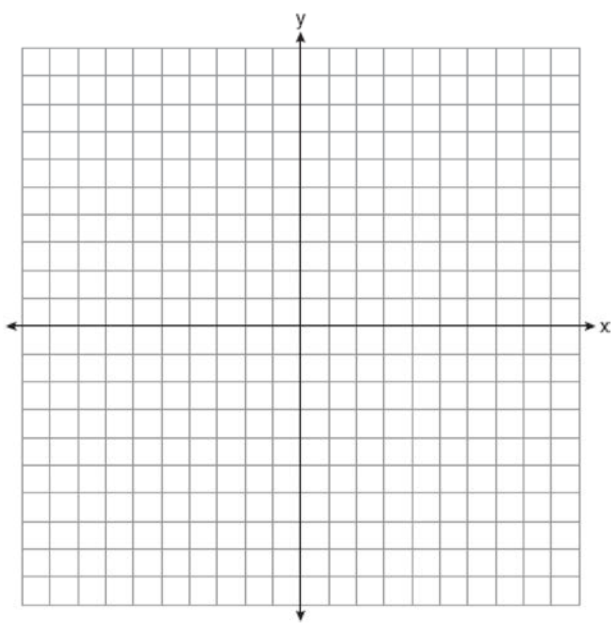


b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part a.

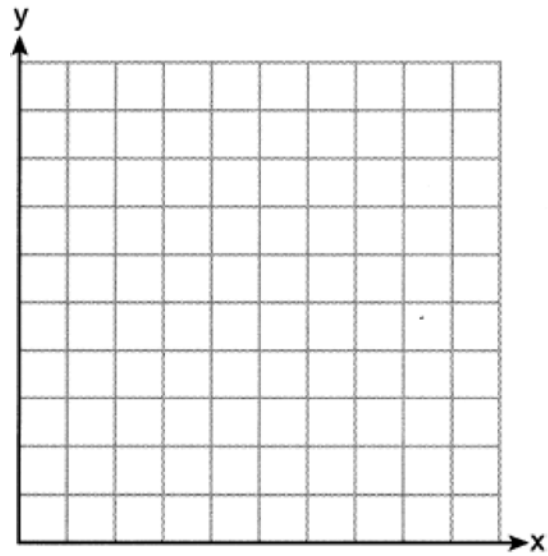
669 Graph $t(x) = 3\sin(2x) + 2$ over the domain $[0, 2\pi]$ on the set of axes below.



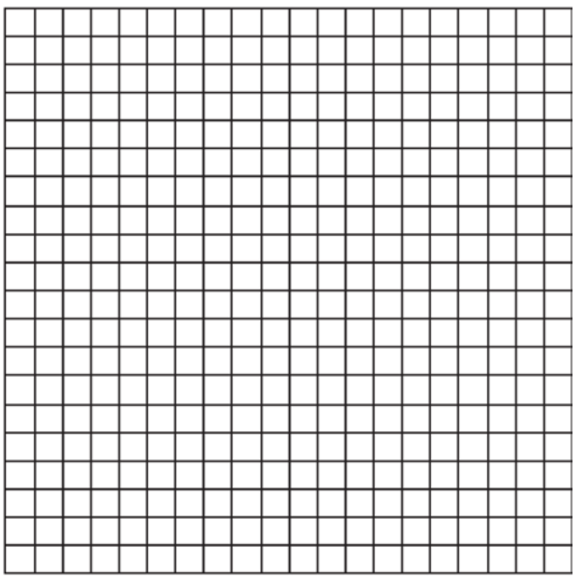
670 Graph *at least one* cycle of $y = 5\sin(4x) - 3$ on the set of axes below.



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

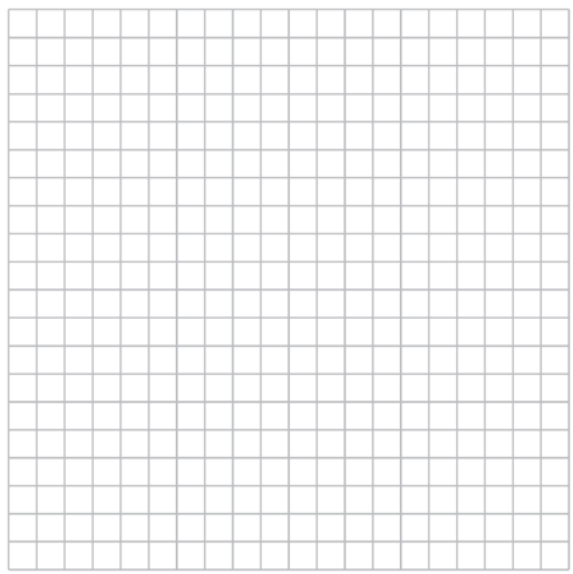


672 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire. Determine the period of $f(t)$. Interpret what the period represents in this context. On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

673 The ocean tides near Carter Beach follow a repeating pattern over time, with the amount of time between each low and high tide remaining relatively constant. On a certain day, low tide occurred at 8:30 a.m. and high tide occurred at 3:00 p.m. At high tide, the water level was 12 inches above the average local sea level; at low tide it was 12 inches below the average local sea level. Assume that high tide and low tide are the maximum and minimum water levels each day, respectively. Write a cosine function of the form $f(t) = A\cos(Bt)$, where A and B are real numbers, that models the water level, $f(t)$, in inches above or below the average Carter Beach sea level, as a function of the time measured in t hours since 8:30 a.m. On the grid below, graph one cycle of this function.

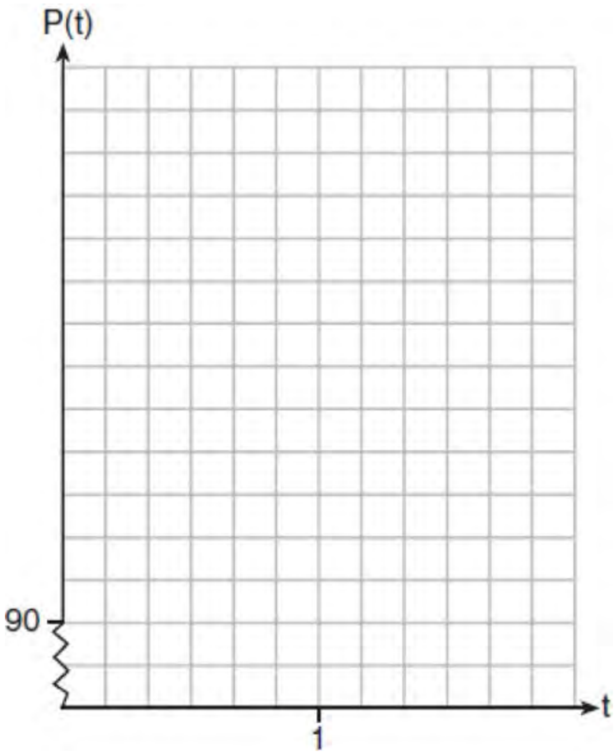


People who fish in Carter Beach know that a certain species of fish is most plentiful when the water level is increasing. Explain whether you would recommend fishing for this species at 7:30 p.m. or 10:30 p.m. using evidence from the given context.

674 The resting blood pressure of an adult patient can be modeled by the function P below, where $P(t)$ is the pressure in millimeters of mercury after time t in seconds.

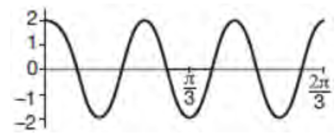
$$P(t) = 24\cos(3\pi t) + 120$$

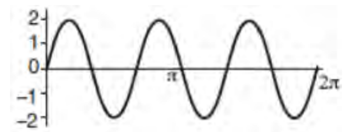
On the set of axes below, graph $y = P(t)$ over the domain $0 \le t \le 2$.

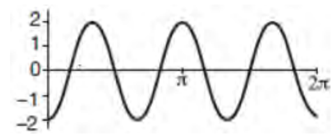


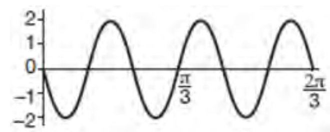
Determine the period of P. Explain what this value represents in the given context. Normal resting blood pressure for an adult is 120 over 80. This means that the blood pressure oscillates between a maximum of 120 and a minimum of 80. Adults with high blood pressure (above 140 over 90) and adults with low blood pressure (below 90 over 60) may be at risk for health disorders. Classify the given patient's blood pressure as low, normal, or high and explain your reasoning.

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

1 

2 

3 

4 

CONICS
G.GPE.A.1: EQUATIONS OF CIRCLES

676 The equation $4x^2 - 24x + 4y^2 + 72y = 76$ is equivalent to
1 $4(x-3)^2 + 4(y+9)^2 = 76$
2 $4(x-3)^2 + 4(y+9)^2 = 121$
3 $4(x-3)^2 + 4(y+9)^2 = 166$
4 $4(x-3)^2 + 4(y+9)^2 = 436$

PROBABILITY
S.CP.A.2: PROBABILITY OF COMPOUND EVENTS

677 On a given school day, the probability that Nick oversleeps is 48% and the probability he has a pop quiz is 25%. Assuming these two events are independent, what is the probability that Nick oversleeps and has a pop quiz on the same day?
1 73%
2 36%
3 23%
4 12%

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

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

S.CP.B.7: ADDITION RULE

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

681 In a survey of people who recently bought a laptop, 45% said they were looking for a large screen, 31% said they were looking for a fast processor, and 58% said they wanted a large screen or a fast processor. If a survey respondent is selected at random, what is the probability that the respondent wanted both a large screen and a fast processor?
1 76%
2 14%
3 77%
4 18%

682 The probability of having math homework is $\frac{1}{3}$ and the probability of having English homework is $\frac{1}{7}$. The probability of having math homework or having English homework is $\frac{9}{21}$. What is the probability of having math homework and having English homework?
1 $\frac{19}{21}$
2 $\frac{1}{5}$
3 $\frac{1}{21}$
4 $\frac{10}{21}$

683 A suburban high school has a population of 1376 students. The number of students who participate in sports is 649. The number of students who participate in music is 433. If the probability that a student participates in either sports or music is $\frac{974}{1376}$, what is the probability that a student participates in both sports and music?

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

685 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let A be the event that the guest room has a view of the lake, and let B be the event that the guest room has a queen-size bed. Events A and B are found to be independent of each other. Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed. Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

686 Given events A and B, such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cup B) = 0.8$, determine whether A and B are independent or dependent.

687 In contract negotiations between a local government agency and its workers, it is estimated that there is a 50% chance that an agreement will be reached on the salaries of the workers. It is estimated that there is a 70% chance that there will be an agreement on the insurance benefits. There is a 20% chance that no agreement will be reached on either issue. Find the probability that an agreement will be reached on *both* issues. Based on this answer, determine whether the agreement on salaries and the agreement on insurance are independent events. Justify your answer.

688 A student is chosen at random from the student body at a given high school. The probability that the student selects Math as the favorite subject is $\frac{1}{4}$. The probability that the student chosen is a junior is $\frac{116}{459}$. If the probability that the student selected is a junior or that the student chooses Math as the favorite subject is $\frac{47}{108}$, what is the exact probability that the student selected is a junior whose favorite subject is Math? Are the events "the student is a junior" and "the student's favorite subject is Math" independent of each other? Explain your answer.

S.CP.A.3: CONDITIONAL PROBABILITY

689 Which situation best describes conditional probability?
1 finding the probability of an event occurring two or more times
2 finding the probability of an event occurring only once
3 finding the probability of two independent events occurring at the same time
4 finding the probability of an event occurring given another event had already occurred

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

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

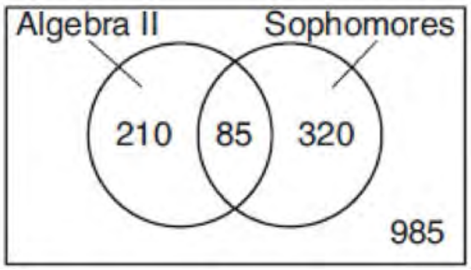
What is $P(B)$?
1 0.1
2 0.25
3 0.375
4 0.667

691 A fast-food restaurant analyzes data to better serve its customers. After its analysis, it discovers that the events D, that a customer uses the drive-thru, and F, that a customer orders French fries, are independent. The following data are given in a report:

$$P(F) = 0.8$$
$$P(F \cap D) = 0.456$$

Given this information, $P(F|D)$ is
1 0.344
2 0.3648
3 0.57
4 0.8

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



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

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

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

1 19%
2 32%
3 33%
4 72%

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

1 independent
2 dependent
3 mutually exclusive
4 complements

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

I: dependent
II: independent
III: mutually exclusive

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

696 A study was designed to test the effectiveness of a new drug. Half of the volunteers received the drug. The other half received a sugar pill. The probability of a volunteer receiving the drug and getting well was 40%. What is the probability of a volunteer getting well, given that the volunteer received the drug?

697 The probability that a resident of a housing community opposes spending money for community improvement on plumbing issues is 0.8. The probability that a resident favors spending money on improving walkways given that the resident opposes spending money on plumbing issues is 0.85. Determine the probability that a randomly selected resident opposes spending money on plumbing issues and favors spending money on walkways.

698 The guidance department has reported that of the senior class, 2.3% are members of key club, K, 8.6% are enrolled in AP Physics, P, and 1.9% are in both. Determine the probability of P given K, to the *nearest tenth of a percent*. The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

S.CP.A.4: CONDITIONAL PROBABILITY

699 Consider the data in the table below.

	Right Handed	Left Handed
Male	87	13
Female	89	11

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

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

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

Favorite Food to Eat While Watching Sports

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

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

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

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

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

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

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

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

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

Which statement is best supported by the data?

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

2 The probability of being late given that a student walked is less than the probability that a student walked given that the student was late.

3 The probability of being late given that a student walked is equal to the probability that a student walked given that the student was late.

4 The probability of being late given that a student walked cannot be determined.

703 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

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

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

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

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

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

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

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

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

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

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

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events “student is a male” and “student prefers reality series” independent of each other? Justify your answer.

707 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

	Juan Wins	Felipe Wins
Short Practice Time	8	10
Long Practice Time	15	12

Given that the practice time was long, determine the exact probability that Filipe wins the next match. Determine whether or not the two events “Filipe wins” and “long practice time” are independent. Justify your answer.

708 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

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

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

709 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

Upperclassmen Transportation Methods			
	Drive	**Take the Bus**	**Walk**
Junior	58	75	12
Senior	81	39	12

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

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

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

711 The results of a poll of 200 students are shown in the table below:

	Preferred Music Style		
	Techno	**Rap**	**Country**
Female	54	25	27
Male	36	40	18

For this group of students, do these data suggest that gender and preferred music styles are independent of each other? Justify your answer.

712 A public radio station held a fund-raiser. The table below summarizes the donor category and method of donation.

		Donor Category	
		Supporter	Patron
Method of Donation	Phone calls	400	672
	Online	1200	2016

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

713 A researcher wants to determine if nut allergies and milk allergies are related to each other. The researcher surveyed 1500 people and asked them if they are allergic to nuts or milk. The survey results are summarized in the table below.

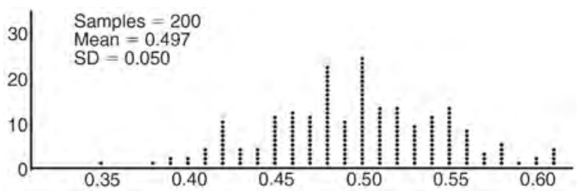
	Allergic to Nuts	Not Allergic to Nuts
Allergic to Milk	3	42
Not Allergic to Milk	12	1443

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

GRAPHS AND STATISTICS

S.IC.A.2: ANALYSIS OF DATA

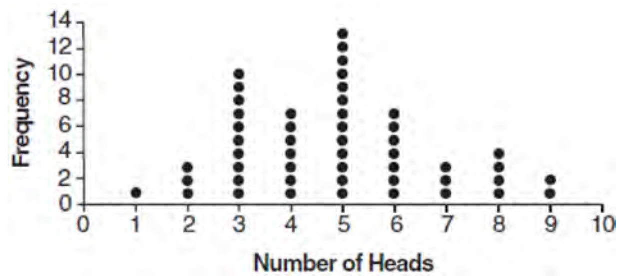
714 Anne has a coin. She does not know if it is a fair coin. She flipped the coin 100 times and obtained 73 heads and 27 tails. She ran a computer simulation of 200 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



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

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

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

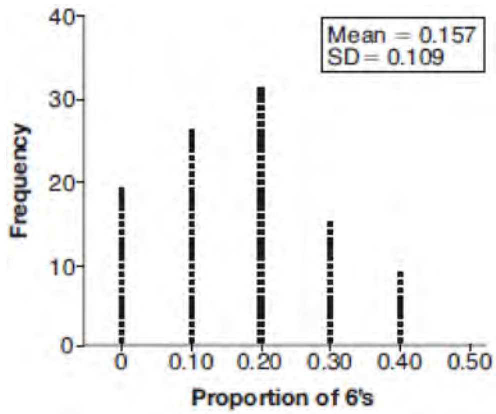


Based on the results of the simulation, which statement is *false*?

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

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

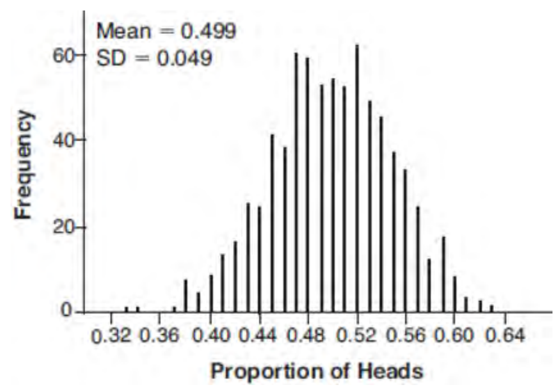
For Miles to win, the spinner must land on the number 6. After spinning the spinner 10 times, and losing all 10 times, Miles complained that the spinner is unfair. At home, his dad ran 100 simulations of spinning the spinner 10 times, assuming the probability of winning each spin is $\frac{1}{6}$. The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



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

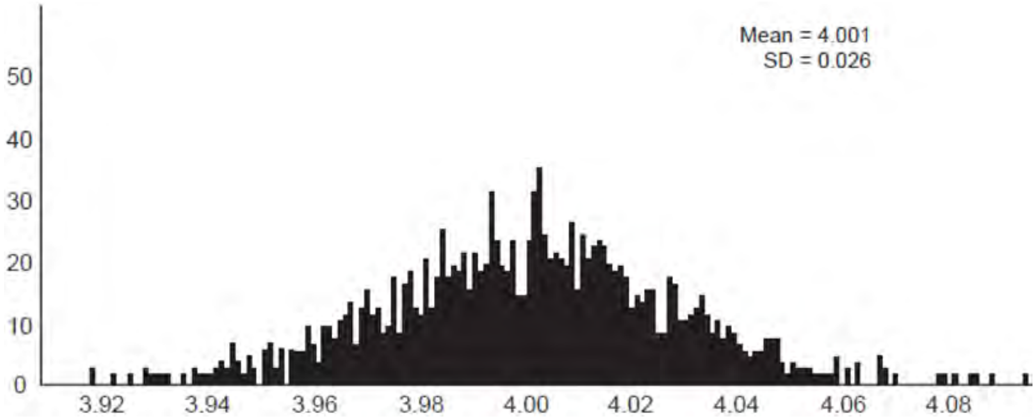
1 The spinner was likely unfair, since the number 6 failed to occur in about 20% of the simulations.
2 The spinner was likely unfair, since the spinner should have landed on the number 6 by the sixth spin.
3 The spinner was likely not unfair, since the number 6 failed to occur in about 20% of the simulations.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

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



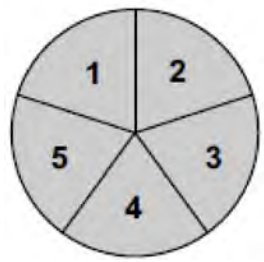
Do the results of the simulation provide strong evidence that Robin's coin is unfair? Explain your answer.

718 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.

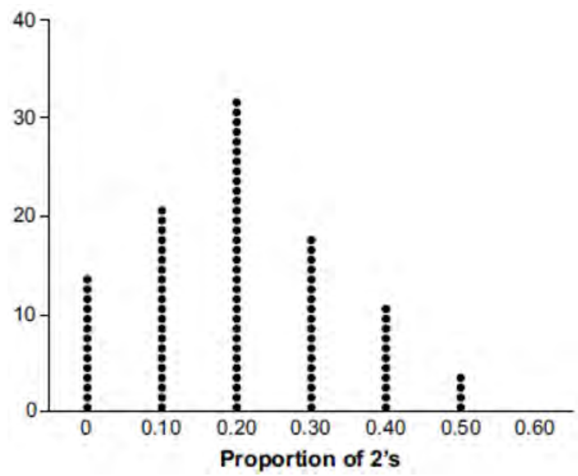


Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

719 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.

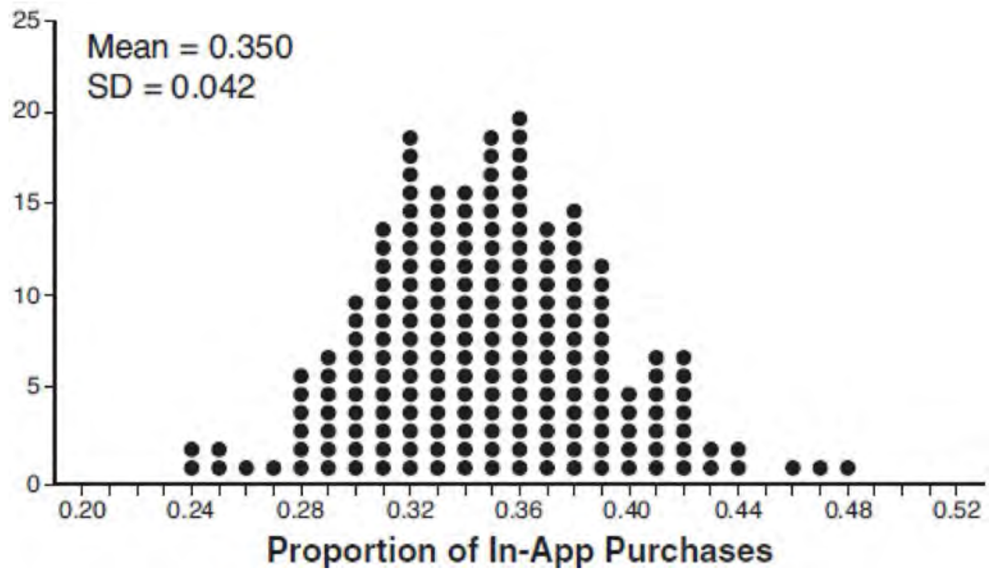


She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game. State the proportion of 2's that were spun. State the theoretical probability of spinning a 2. The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.



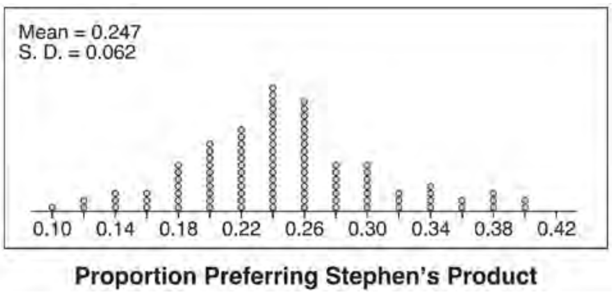
Does the output indicate that the carnival game was unfair? Explain your answer.

720 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.



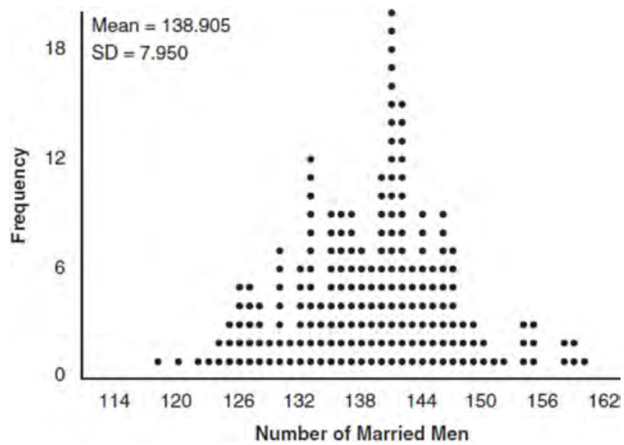
Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.

721 Stephen's Beverage Company is considering whether to produce a new brand of cola. The company will launch the product if at least 25% of cola drinkers will buy the product. Fifty cola drinkers are randomly selected to take a blind taste-test of products *A*, *B*, and the new product. Nine out of fifty participants preferred Stephen's new cola to products *A* and *B*. The company then devised a simulation based on the requirement that 25% of cola drinkers will buy the product. Each dot in the graph shown below represents the proportion of people who preferred Stephen's new product, each of sample size 50, simulated 100 times.



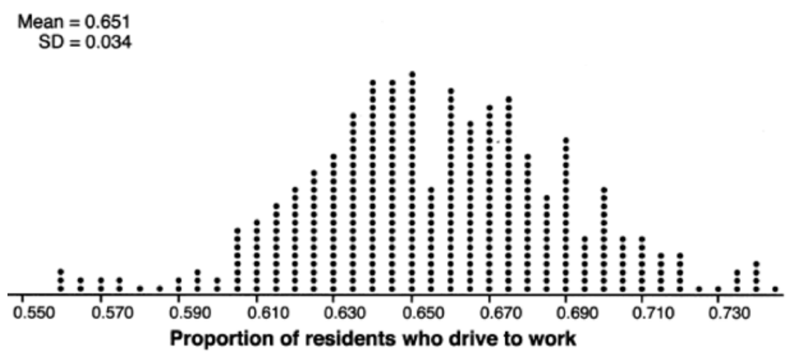
Assume the set of data is approximately normal and the company wants to be 95% confident of its results. Does the sample proportion obtained from the blind taste-test, nine out of fifty, fall within the margin of error developed from the simulation? Justify your answer. The company decides to continue developing the product even though only nine out of fifty participants preferred its brand of cola in the taste-test. Describe how the simulation data could be used to support this decision.

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



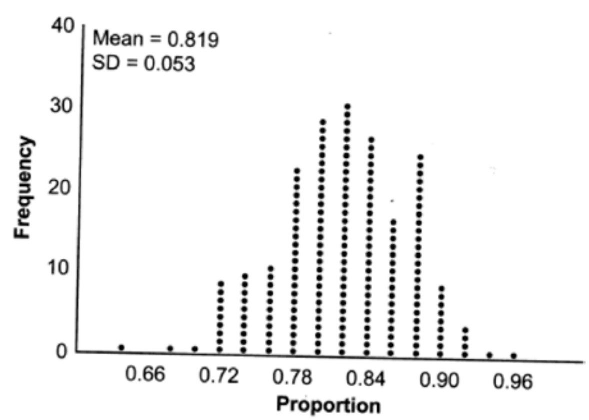
a) Based on the simulation, create an interval in which the middle 95% of the number of married men may fall. Round your answer to the *nearest integer*.
b) A study claims "50 percent of men 21 and older in the United States are married." Do your results from part a contradict this claim? Explain.

723 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



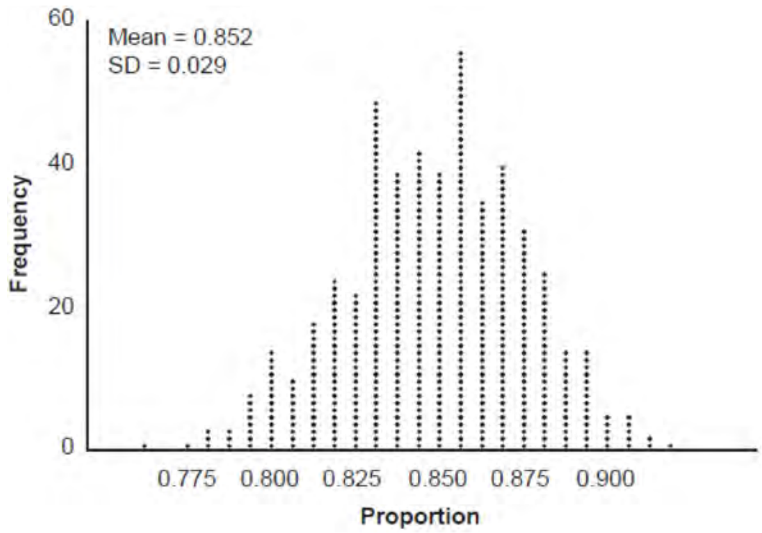
Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*. One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

724 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



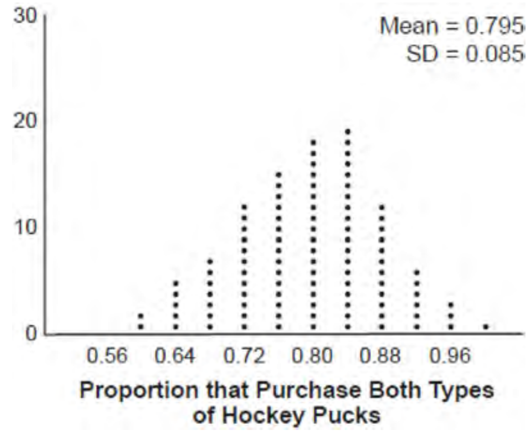
Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*. The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

725 An app design company believes that the proportion of high school students who have purchased apps on their smartphones in the past 3 months is 0.85. A simulation of 500 samples of 150 students was run based on this proportion and the results are shown below.



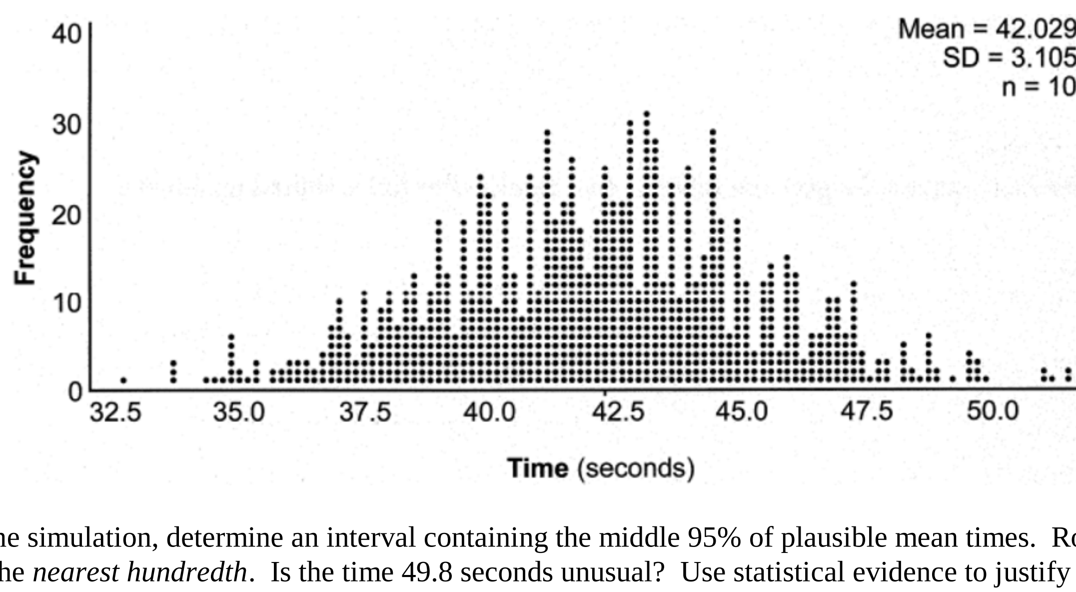
Suppose a sample of 150 students from your high school showed that 88% of students had purchased apps on their smartphones in the past 3 months. Based on the simulation, would the results from your high school give the app design company reason to believe their assumption is *incorrect*? Explain.

726 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

727 In a packaging plant, a machine packs boxes with jars. The machine's manufacturer states that a box is packed, on average, every 42 seconds. To test that claim, the packaging plant randomly selects a sample of 10 boxes and finds the sample mean to be 49.8 seconds. The company ran a simulation of 1000 trials based on the manufacturer's claim. The approximately normal results are shown below.

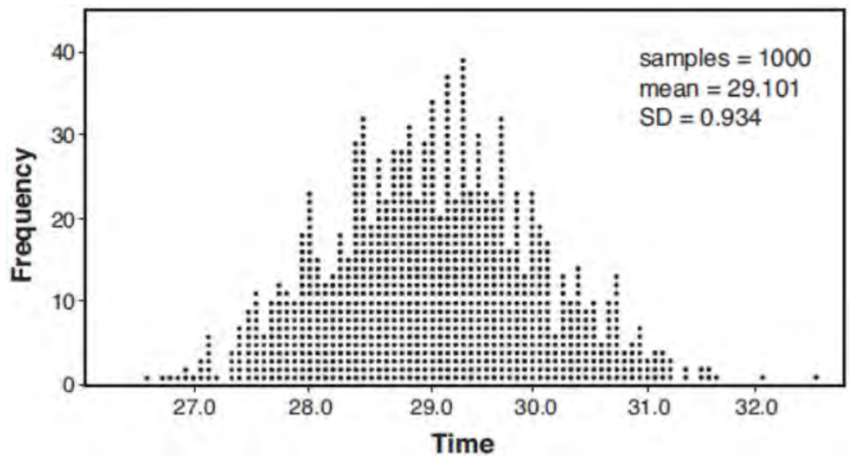


Based on the simulation, determine an interval containing the middle 95% of plausible mean times. Round your answer to the *nearest hundredth*. Is the time 49.8 seconds unusual? Use statistical evidence to justify your answer.

728 A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

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

S.IC.B.3: ANALYSIS OF DATA

730 Which investigation technique is most often used to determine if a single variable has an impact on a given population?
1 observational study
2 random survey
3 controlled experiment
4 formal interview

731 A teacher randomly divides all of her students into two groups. She grades the homework for one group but does not grade the homework for the other group. All homework is returned to the students. She then compares test scores for each of the groups to see if grading homework has an effect on the tests cores. This method of data collection is best described as
1 an experiment
2 an unbiased survey
3 a simulation
4 an observational study

732 A researcher randomly divides 50 bean plants into two groups. He puts one group by a window to receive natural light and the second group under artificial light. He records the growth of the plants weekly. Which data collection method is described in this situation?
1 observational study
2 controlled experiment
3 survey
4 systematic sample

733 A sociologist reviews randomly selected surveillance videos from a public park over a period of several years and records the amount of time people spent on a smartphone. The statistical procedure the sociologist used is called
1 a census
2 an experiment
3 an observational study
4 a sample survey

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

735 A researcher wants to determine if room-darkening shades cause people to sleep longer. Which method of data collection is most appropriate?
1 census
2 survey
3 observation study
4 controlled experiment

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

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

738 A cafeteria food manager studied the lunchtime eating habits of a group of employees in their office building. The purpose of the study was to determine the proportion of employees who purchased lunch in the cafeteria, brought their lunch from home, or purchased lunch from an outside vendor. This collection of data would best be classified as
1 a census
2 an experiment
3 an observational study
4 a simulation

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

740 Which statement about data collection is most accurate?
1 A survey about parenting styles given to every tenth student entering the library will provide unbiased results.
2 An observational study allows a researcher to determine the cause of an outcome.
3 Margin of error increases as sample size increases.
4 A survey collected from a random sample of students in a school can be used to represent the opinions of the school population.

741 Which statement about statistical analysis is *false*?
1 Experiments can suggest patterns and relationships in data.
2 Experiments can determine cause and effect relationships.
3 Observational studies can determine cause and effect relationships.
4 Observational studies can suggest patterns and relationships in data.

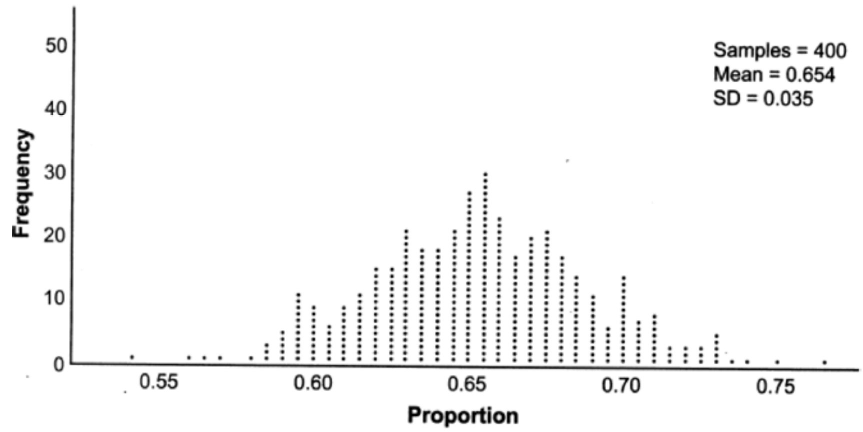
742 According to a study, 45% of Americans have type O blood. If a random number generator produces three-digit values from 000 to 999, which values would represent those having type O blood?
1 between 000 and 045, inclusive
2 between 000 and 444, inclusive
3 between 000 and 449, inclusive
4 between 000 and 450, inclusive

743 Abby is told that each day there is a 50% chance it will rain. Which simulation can Abby perform to determine the likelihood of it raining for the next seven days?
1 Flip a coin seven times, count how many heads, and repeat 50 times.
2 Roll a die seven times, count how many twos, and repeat 50 times.
3 Roll a pair of dice, count totals of seven, and repeat 50 times.
4 Flip a coin 50 times and count how many heads.

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

S.IC.B.4: ANALYSIS OF DATA

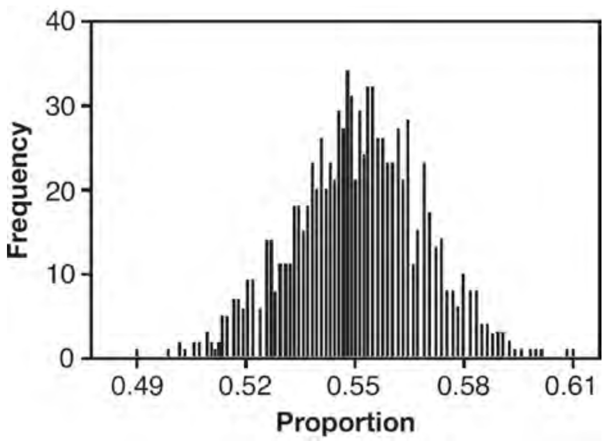
745 Betty conducted a survey of her class to see if they like pizza. She gathered 200 responses and 65% of the voters said they did like pizza. Betty then ran a simulation of 400 more surveys, each with 200 responses, assuming that 65% of the voters would like pizza. The output of the simulation is shown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



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

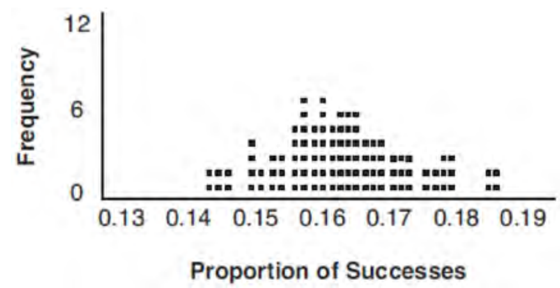
1	0.01	3	0.05
2	0.02	4	0.07

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



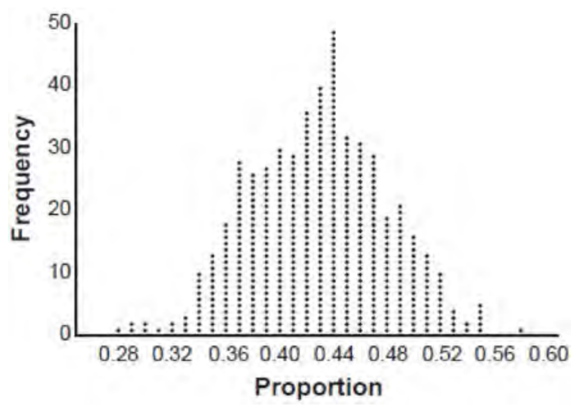
Given this output, and assuming a 95% confidence level, the margin of error for the poll is closest to
1 0.01
2 0.03
3 0.06
4 0.12

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



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

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

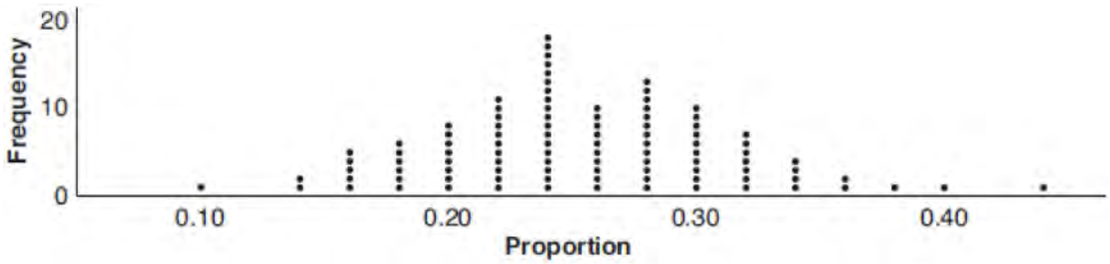


The standard deviation of the simulation is closest to

1 0.02
2 0.05
3 0.09
4 0.43

S.IC.B.5: ANALYSIS OF DATA

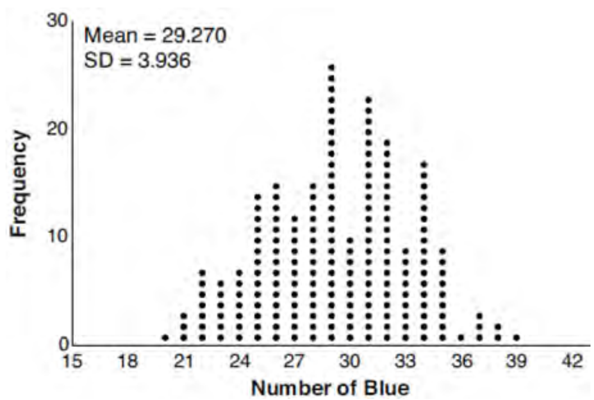
749 A group of students was trying to determine the proportion of candies in a bag that are blue. The company claims that 24% of candies in bags are blue. A simulation was run 100 times with a sample size of 50, based on the premise that 24% of the candies are blue. The approximately normal results of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



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

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

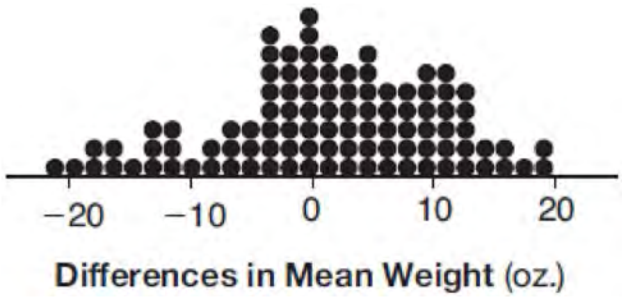
750 The J& B candy company claims that 45% of the candies it produces are blue, 30% are brown, and 25% are yellow. Each bag holds 65 candies. A simulation was run 200 times, each of sample size 65, based on the premise that 45% of the candies are blue. The results of the simulation are shown below.



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

1 The company is not meeting their production standard.
2 Bonnie's bag was a rarity and the company should not be concerned.
3 The company should change their claim to 37% blue candies are produced.
4 Bonnie's bag is within the middle 95% of the simulated data supporting the company's claim.

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



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

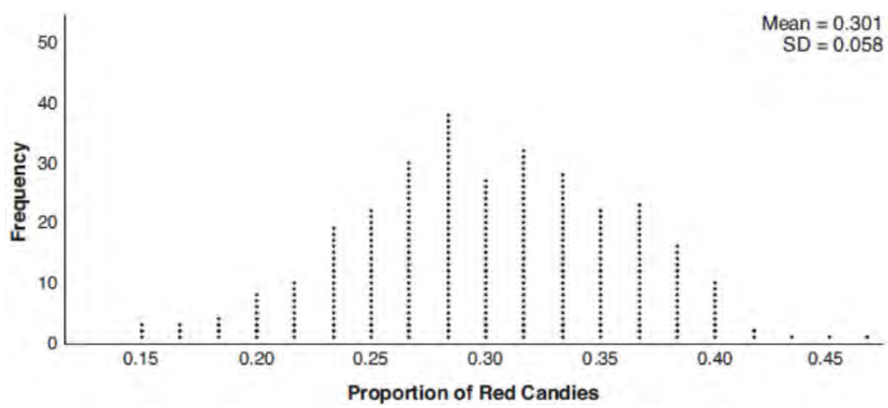
1 There was no effect observed between the two groups.

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

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

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

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

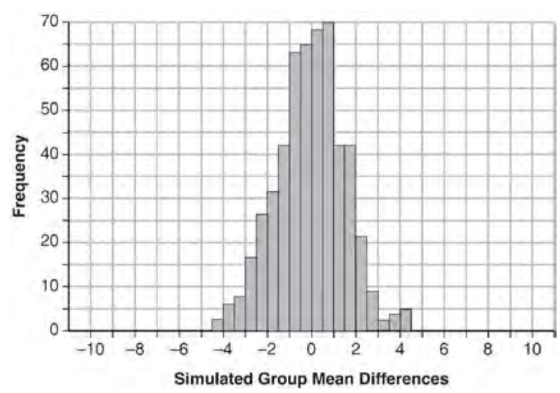


Based on the simulation, determine the middle 95% of plausible values that the proportion of red candies in a pack is within. Based on the simulation, is it unusual that Mary's pack had 14 red candies out of a total of 60? Explain.

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

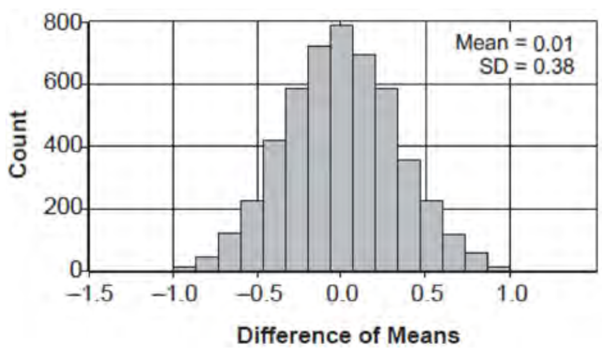
	Group 1	Group 2
$\bar{x}$	80.16	83.8
S_x	6.9	5.2

Calculate the mean difference in the final grades (group 1 – group 2) and explain its meaning in the context of the problem. A simulation was conducted in which the students' final grades were rerandomized 500 times. The results are shown below.



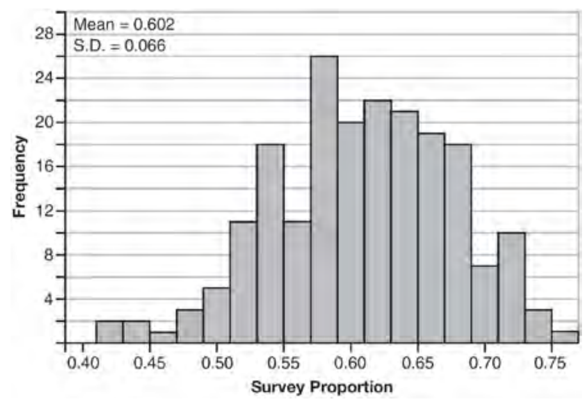
Use the simulation to determine if there is a significant difference in the final grades. Explain your answer.

754 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



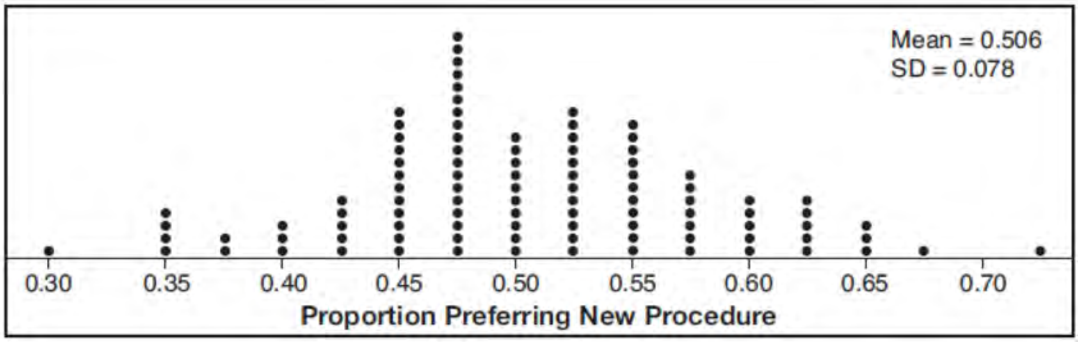
Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*. Does the interval indicate that the difference between the classes' grades is significant? Explain.

755 Fifty-five students attending the prom were randomly selected to participate in a survey about the music choice at the prom. Sixty percent responded that a DJ would be preferred over a band. Members of the prom committee thought that the vote would have 50% for the DJ and 50% for the band. A simulation was run 200 times, each of sample size 55, based on the premise that 60% of the students would prefer a DJ. The approximate normal simulation results are shown below.



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

756 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.

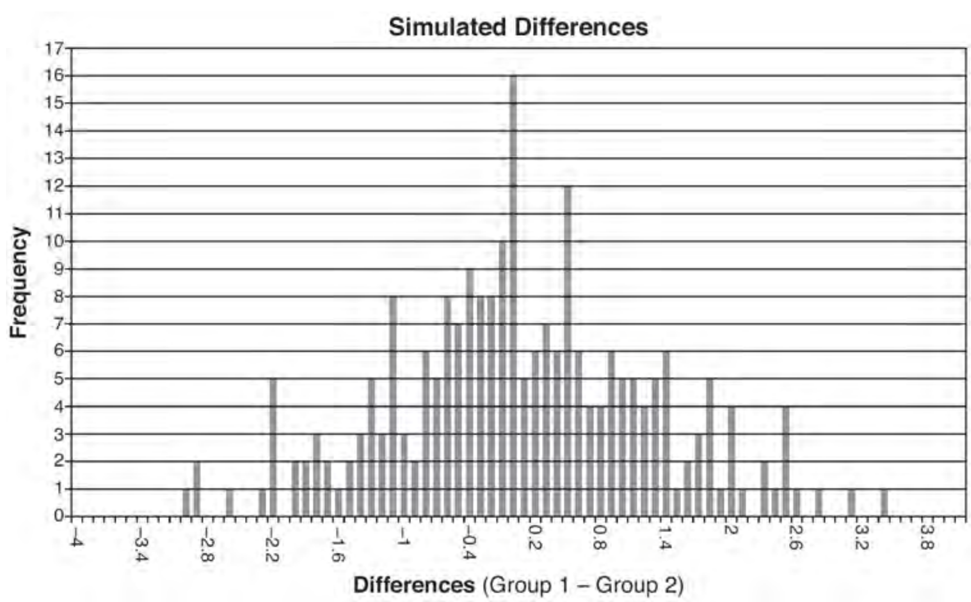


Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*. Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

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

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

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

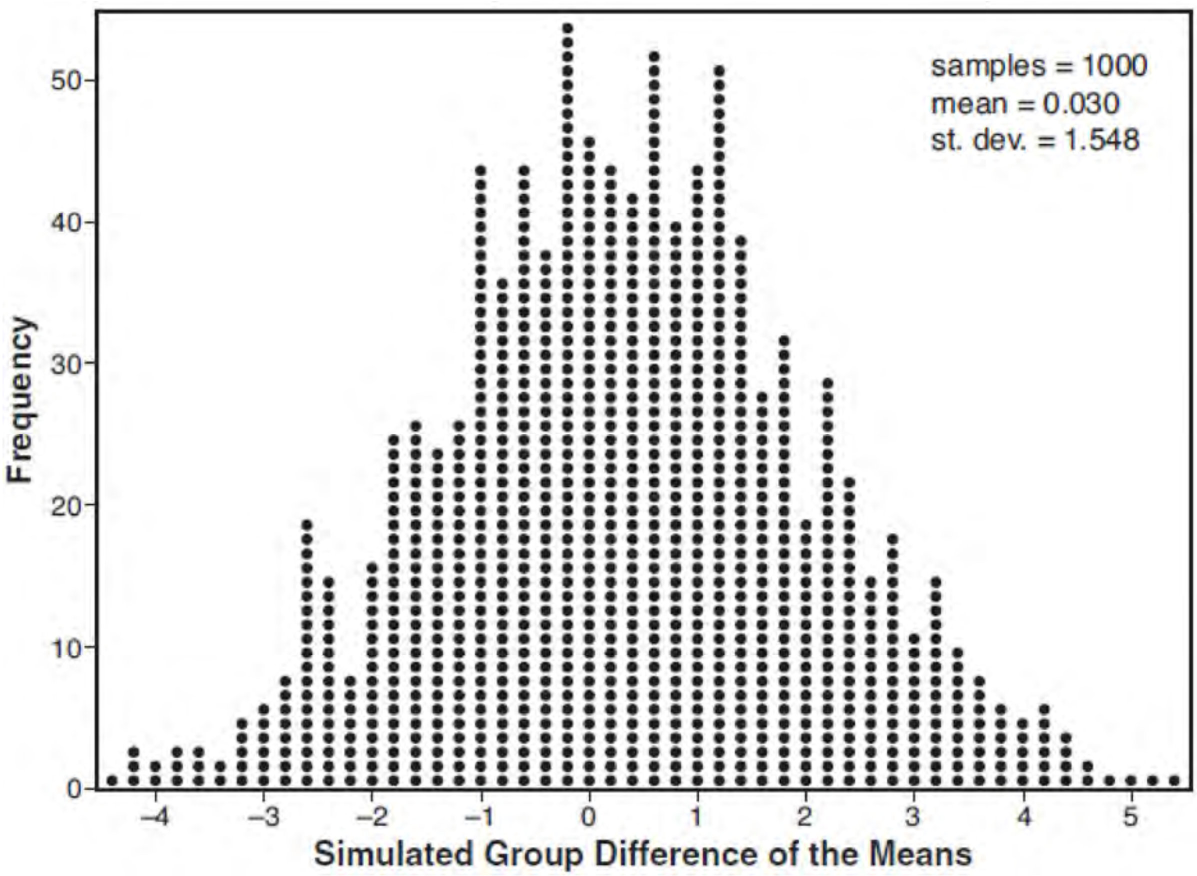


Ayva has decided that the difference in mean reading times is not an unusual occurrence. Support her decision using the results of the simulation. Explain your reasoning.

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

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

Calculate the difference in means in the experimental test grades (scented -unscented). A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.

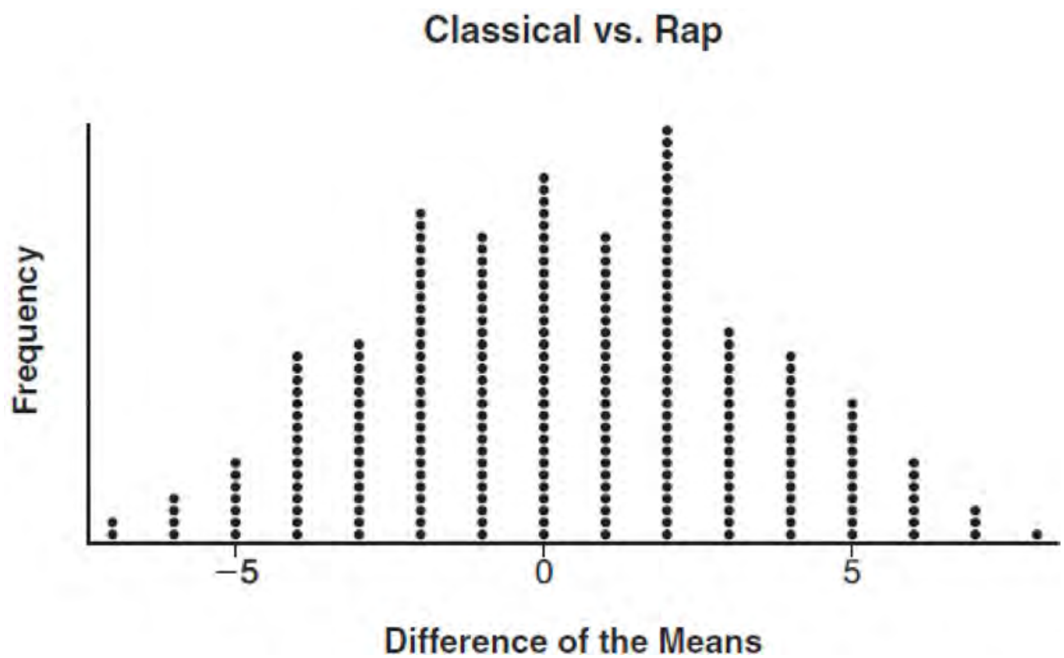


Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*. Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

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

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

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



Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

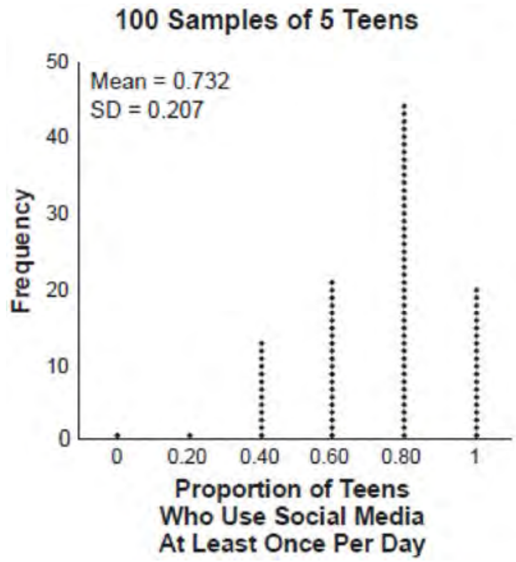
S.IC.B.6: ANALYSIS OF DATA

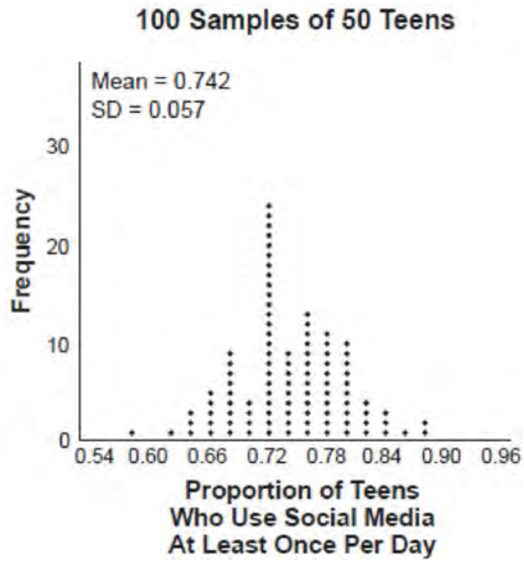
760 A company wishes to determine the cooking time for one pound of spaghetti. The company's technicians cooked one pound of spaghetti and recorded the time needed for the spaghetti to be ready to eat. Repeating this process 35 times resulted in an approximately normal distribution, with a mean of 9.82 minutes and a standard deviation of 1.4 minutes. In which interval should the middle 95% of cooking times fall?
1 $(8.42, 11.22)$
2 $(7.02, 12.62)$
3 $(9.35, 10.29)$
4 $(6.82, 11.32)$

761 A public opinion poll was conducted on behalf of Mayor Ortega's reelection campaign shortly before the election. 264 out of 550 likely voters said they would vote for Mayor Ortega; the rest said they would vote for his opponent. Which statement is *least* appropriate to make, according to the results of the poll?
1 There is a 48% chance that Mayor Ortega will win the election.
2 The point estimate ($\hat{p}$) of voters who will vote for Mayor Ortega is 48%.
3 It is most likely that between 44% and 52% of voters will vote for Mayor Ortega.
4 Due to the margin of error, an inference cannot be made regarding whether Mayor Ortega or his opponent is most likely to win the election.

762 The Hot and Tasty Coffee chain conducts a survey of its customers at its location at the Staten Island ferry terminal. After the survey is completed, the statistical consultant states that 70% of customers who took the survey said the most important factor in choosing where to get their coffee is how fast they are served. Based on this result, Hot and Tasty Coffee can infer that
1 most of its customers in New York State care most about being served quickly
2 coffee drinkers care less about taste and more about being served quickly
3 most of its customers at the Staten Island ferry terminal care most about being served quickly
4 most of its customers at transportation terminals and stations care most about being served quickly

763 Two surveys were conducted to estimate the proportion of teens who use social media at least once per day.





Based on these results, it was determined that approximately 75% of teens use social media at least once per day. What is the best explanation of the difference in the results between the two surveys?

1 The smaller sample size of five teens resulted in a smaller margin of error and should provide a more accurate estimate.
2 The smaller sample size of five teens resulted in a bigger margin of error and should provide a more accurate estimate.
3 The larger sample size of 50 teens resulted in a smaller margin of error and should provide a more accurate estimate.
4 The larger sample size of 50 teens resulted in a bigger margin of error and should provide a more accurate estimate.

764 A survey was given to 1250 randomly selected high school students at the end of their junior year. The survey offered four post-graduation options: two-year college, four-year college, military, or work. Of the 1250 responses, 475 chose a four-year college. State *one* possible conclusion that can be made about the population of high school juniors, based on this survey.

765 An orange-juice processing plant receives a truckload of oranges. The quality control team randomly chooses three pails of oranges, each containing 50 oranges, from the truckload. Identify the sample and the population in the given scenario. State *one* conclusion that the quality control team could make about the population if 5% of the sample was found to be unsatisfactory.

766 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again. A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

767 Cheap and Fast gas station is conducting a consumer satisfaction survey. Which method of collecting data would most likely lead to a biased sample?
1 interviewing every 5th customer to come into the station
2 interviewing customers chosen at random by a computer at the checkout
3 interviewing customers who call an 800 number posted on the customers' receipts
4 interviewing every customer who comes into the station on a day of the week chosen at random out of a hat

768 The operator of the local mall wants to find out how many of the mall's employees make purchases in the food court when they are working. She hopes to use these data to increase the rent and attract new food vendors. In total, there are 1023 employees who work at the mall. The best method to obtain a random sample of the employees would be to survey
1 all 170 employees at each of the larger stores
2 50% of the 90 employees of the food court
3 every employee
4 every 30th employee entering each mall entrance for one week

769 A random sample of 100 people that would best estimate the proportion of all registered voters in a district who support improvements to the high school football field should be drawn from registered voters in the district at a
1 football game
2 supermarket
3 school fund-raiser
4 high school band concert

770 Mrs. Favata's statistics class wants to conduct a survey to see how students feel about changing the school mascot's name. Which plan is the best process for gathering an appropriate sample?
1 Survey students in a random sample of senior homerooms.
2 Survey every tenth student entering art classes in the school.
3 Survey every fourth student entering the cafeteria during each lunch period.
4 Survey all members of the school's varsity sports teams.

771 A group of high school students wanted to collect information on how many times per week students exercised. If they want the *least* biased results they should survey every fifth student at the school who is
1 entering the gym
2 in the junior class
3 entering the library
4 entering the building

772 Which statement(s) about statistical studies is true?
I. A survey of all English classes in a high school would be a good sample to determine the number of hours students throughout the school spend studying.
II. A survey of all ninth graders in a high school would be a good sample to determine the number of student parking spaces needed at that high school.
III. A survey of all students in one lunch period in a high school would be a good sample to determine the number of hours adults spend on social media websites.
IV. A survey of all Calculus students in a high school would be a good sample to determine the number of students throughout the school who don’t like math.
1 I, only
2 II, only
3 I and III
4 III and IV

773 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.

The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

774 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the-students of the first period computer science class. Explain a statistical bias in the method of data collection.

775 The business office of a local college wishes to determine the methods of payment that will be used by students when buying books at the beginning of a semester. Explain how the office can gather an appropriate sample that minimizes bias.

S.ID.B.6: REGRESSION

776 The number of bacteria in a sample, which can be modeled by an exponential regression, is shown in the table below.

Time Since Observation Began (hours)	0	1	2	3.5	4
Number of Bacteria	40	48	57	75	82

Assuming this trend continues, approximately how many bacteria would be present 8 hours after the observation began?

1 123
2 127
3 168
4 180

777 A popular celebrity tracks the number of people, in thousands, who have followed her on social media since January 1, 2015. A summary of the data she recorded is shown in the table below:

Number of Months Since January 2015	2	11	16	20	27	35	47	50	52
Number of Social Media Followers (thousands)	3.1	7.5	29.7	49.7	200.3	680.3	5200.3	8109.3	12,107.1

The celebrity uses an exponential regression equation to model the data. According to the model, about how many followers did she have on June 1, 2018?

1 13,000,000
2 5,420,000
3 1,850,000
4 790,000

778 Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

State an exponential regression equation to model these data, rounding all values to the *nearest thousandth*.

779 A runner is using a nine-week training app to prepare for a "fun run." The table below represents the amount of the program completed, A, and the distance covered in a session, D, in miles.

A	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{6}{9}$	$\frac{8}{9}$	1
D	2	2	2.25	3	3.25

Based on these data, write an exponential regression equation, rounded to the *nearest thousandth*, to model the distance the runner is able to complete in a session as she continues through the nine-week program.

780 A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

t	0	5	10	15	20	25
F(t)	180	144	120	104	93.3	86.2

Based on these data, write an exponential regression equation, $F(t)$, to model the temperature of the coffee. Round all values to the *nearest thousandth*.

781 Using a microscope, a researcher observed and recorded the number of bacteria spores on a large sample of uniformly sized pieces of meat kept at room temperature. A summary of the data she recorded is shown in the table below.

Hours (x)	**Average Number of Spores** (y)
0	4
0.5	10
1	15
2	60
3	260
4	1130
6	16,380

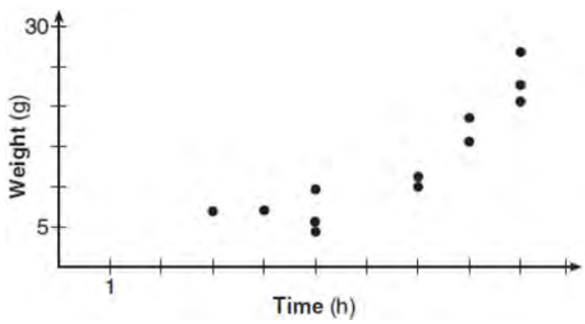
Using these data, write an exponential regression equation, rounding all values to the *nearest thousandth*. The researcher knows that people are likely to suffer from food-borne illness if the number of spores exceeds 100. Using the exponential regression equation, determine the maximum amount of time, to the *nearest quarter hour*, that the meat can be kept at room temperature safely.

782 The table below gives air pressures in kPa at selected altitudes above sea level measured in kilometers.

x	**Altitude** (km)	0	1	2	3	4	5
y	**Air Pressure** (kPa)	101	90	79	70	62	54

Write an exponential regression equation that models these data rounding all values to the *nearest thousandth*. Use this equation to algebraically determine the altitude, to the *nearest hundredth* of a kilometer, when the air pressure is 29 kPa.

783 A scatterplot showing the weight, w, in grams, of each crystal after growing t hours is shown below.



The relationship between weight, w, and time, t, is best modeled by

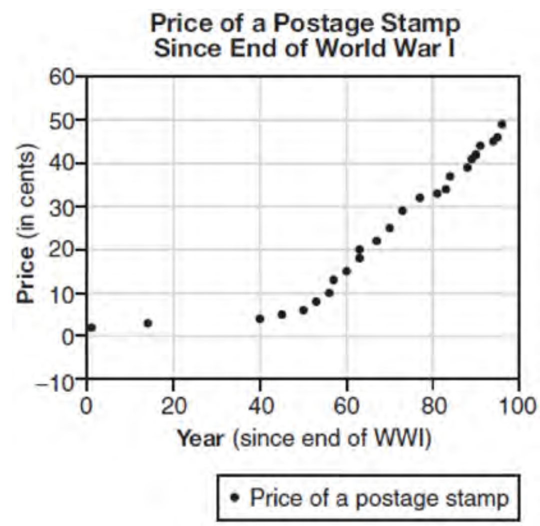
1 $w = 4^t + 5$

2 $w = (1.4)^t + 2$

3 $w = 5(2.1)^t$

4 $w = 8(.75)^t$

784 The price of a postage stamp in the years since the end of World War I is shown in the scatterplot below.



The equation that best models the price, in cents, of a postage stamp based on these data is

1 $y = 0.59x - 14.82$

2 $y = 1.04(1.43)^x$

3 $y = 1.43(1.04)^x$

4 $y = 24\sin(14x) + 25$

785 The cost, in dollars, of a single-ride fare in the New York City subway in the years since 1904 is listed in the table below.

Years since 1904 (x)	0	49	72	91	99	111
Fare (y)	\$0.05	\$0.15	\$0.50	\$1.50	\$2.00	\$2.75

Which equation best models the cost of a single-ride fare based on these data?

1 $y = 0.0375(1.0392)^x$

2 $y = 1.0392(0.0375)^x$

3 $y = 0.0234x - 0.487$

4 $y = -0.179 + 0.356\ln(x)$

S.ID.A.4: NORMAL DISTRIBUTIONS

786 Suppose two sets of test scores have the same mean, but different standard deviations, σ_1 and σ_2, with $\sigma_2 > \sigma_1$. Which statement best describes the variability of these data sets?
1 Data set one has the greater variability.
2 Data set two has the greater variability.
3 The variability will be the same for each data set.
4 No conclusion can be made regarding the variability of either set.

787 The heights of women in the United States are normally distributed with a mean of 64 inches and a standard deviation of 2.75 inches. The percent of women whose heights are between 64 and 69.5 inches, to the *nearest whole percent*, is
1 6
2 48
3 68
4 95

788 A manufacturer claims that the number of ounces of a beverage dispensed by one of its automatic dispensers is normally distributed with a mean of 8.0 ounces and a standard deviation of 0.04 ounces. To the *nearest tenth of a percent*, what percent of the cups filled by this company's dispenser will contain between 7.9 and 8.11 ounces?
1 99.5
2 99.4
3 99.1
4 97.6

789 The scores on a mathematics college-entry exam are normally distributed with a mean of 68 and standard deviation 7.2. Students scoring higher than one standard deviation above the mean will not be enrolled in the mathematics tutoring program. How many of the 750 incoming students can be expected to be enrolled in the tutoring program?
1 631
2 512
3 238
4 119

790 The heights of the members of a ski club are normally distributed. The average height is 64.7 inches with a standard deviation of 4.3 inches. Determine the percentage of club members, to the *nearest percent*, who are between 67 inches and 72 inches tall.

791 A population is normally distributed with a mean of 23 and a standard deviation of 1.2. The percentage of the population that falls below 21, to the *nearest hundredth*, is
1 0.05
2 4.78
3 8.29
4 91.30

792 The distribution of the diameters of ball bearings made under a given manufacturing process is normally distributed with a mean of 4 cm and a standard deviation of 0.2 cm. What proportion of the ball bearings will have a diameter less than 3.7 cm?
1 0.0668
2 0.4332
3 0.8664
4 0.9500

793 The mean intelligence quotient (IQ) score is 100, with a standard deviation of 15, and the scores are normally distributed. Given this information, the approximate percentage of the population with an IQ greater than 130 is closest to
1 2%
2 31%
3 48%
4 95%

794 The heights of the students at Central High School can be modeled by a normal distribution with a mean of 68.1 and a standard deviation of 3.4 inches. According to this model, approximately what percent of the students would have a height less than 60 inches or greater than 75 inches?
1 0.86%
2 1.26%
3 2.12%
4 2.98%

795 The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.

796 The monthly unemployment rate of towns in the United States is approximately normally distributed with a mean rate of 5.2% and a standard deviation of 1.6%. Determine the percentage of towns, to the *nearest integer*, that have a monthly unemployment rate greater than 6%.

797 The lifespan of a 60-watt lightbulb produced by a company is normally distributed with a mean of 1450 hours and a standard deviation of 8.5 hours. If a 60-watt lightbulb produced by this company is selected at random, what is the probability that its lifespan will be between 1440 and 1465 hours?
1 0.3803
2 0.4612
3 0.8415
4 0.9612

798 The weights of bags of Graseck's Chocolate Candies are normally distributed with a mean of 4.3 ounces and a standard deviation of 0.05 ounces. What is the probability that a bag of these chocolate candies weighs less than 4.27 ounces?
1 0.2257
2 0.2743
3 0.7257
4 0.7757

799 Two versions of a standardized test are given, an April version and a May version. The statistics for the April version show a mean score of 480 and a standard deviation of 24. The statistics for the May version show a mean score of 510 and a standard deviation of 20. Assume the scores are normally distributed. Joanne took the April version and scored in the interval 510-540. What is the probability, to the *nearest ten thousandth*, that a test paper selected at random from the April version scored in the same interval? Maria took the May version. In what interval must Maria score to claim she scored as well as Joanne?

800 In 2013, approximately 1.6 million students took the Critical Reading portion of the SAT exam. The mean score, the modal score, and the standard deviation were calculated to be 496, 430, and 115, respectively. Which interval reflects 95% of the Critical Reading scores?
1 430 ± 115
2 430 ± 230
3 496 ± 115
4 496 ± 230

801 In a small city, there are 22 gas stations. The mean price for a gallon of regular gas was \$2.12 with a standard deviation of \$0.05. The distribution of the data was approximately normal. Given this information, the middle 95% of the gas stations in this small city likely charge
1 \$1.90 to \$2.34 for a gallon of gas
2 \$1.97 to \$2.27 for a gallon of gas
3 \$2.02 to \$2.22 for a gallon of gas
4 \$2.07 to \$2.17 for a gallon of gas

802 The heights of the 3300 students at Oceanview High School are approximately normally distributed with a mean of 65.5 inches and a standard deviation of 2.9 inches. The number of students at Oceanview who are between 64 and 68 inches tall is closest to
1 1660
2 1070
3 2244
4 1640

803 There are 440 students at Thomas Paine High School enrolled in U.S. History. On the April report card, the students' grades are approximately normally distributed with a mean of 79 and a standard deviation of 7. Students who earn a grade less than or equal to 64.9 must attend summer school. The number of students who must attend summer school for U.S. History is closest to
1 3
2 5
3 10
4 22

804 A family owned grocery store in New Hartford, NY employs 49 people whose ages are approximately normally distributed with a mean of 36 years and a standard deviation of 6.2 years. Ryan has been hired to work at this store. He is 30 years old. How many people who work at this store would you expect to be younger than Ryan?
1 17
2 7
3 41
4 8

805 The scores on a collegiate mathematics readiness assessment are approximately normally distributed with a mean of 680 and a standard deviation of 120. Determine the percentage of scores between 690 and 900, to the *nearest percent*.

806 There are 400 students in the senior class at Oak Creek High School. All of these students took the SAT. The distribution of their SAT scores is approximately normal. The number of students who scored within 2 standard deviations of the mean is approximately
1 75
2 95
3 300
4 380

807 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

808 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

Algebra II Regents Exam Questions by State Standard: Topic
Answer Section

1 ANS: 1

(1) $\frac{9-0}{2-1}=9$ (2) $\frac{17-0}{3.5-1}=6.8$ (3) $\frac{0-0}{5-1}=0$ (4) $\frac{17--5}{3.5-1}\approx 6.3$

PTS: 2 REF: 011724aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: graph

2 ANS: 1 PTS: 2 REF: 061904aii NAT: F.IF.B.6
TOP: Rate of Change KEY: graph

3 ANS: 2

1) $\frac{29860-629}{1910-1850}\approx 487$; 2) $\frac{790390-494290}{2010-1990}\approx 14805$; 3) $\frac{251808-132459}{1970-1950}\approx 5967$; 4) $\frac{251808-14575}{1970-1890}\approx 2965$

PTS: 2 REF: 062301aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: table

4 ANS: 4

$g(x)$: $\frac{10-6}{4-2}=2$ $t(x)$: $\frac{3--5}{4-2}=4$

PTS: 2 REF: 062212aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: graph | table

5 ANS:

$\frac{60-20}{4-2}=\frac{40}{2}=20$

PTS: 2 REF: 082225aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: graph

6 ANS:

$\frac{306.25-156.25}{70-50}=\frac{150}{20}=7.5$ Between 50-70 mph, each additional mph in speed requires 7.5 more feet to stop.

PTS: 2 REF: 081631aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: table

7 ANS: 4

(1) $\frac{B(60)-B(10)}{60-10}\approx 28\%$ (2) $\frac{B(69)-B(19)}{69-19}\approx 33\%$ (3) $\frac{B(72)-B(36)}{72-36}\approx 38\%$ (4) $\frac{B(73)-B(60)}{73-60}\approx 46\%$

PTS: 2 REF: 011721aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

8 ANS: 1

$\frac{N(6)-N(0)}{6-0}\approx -8.93$

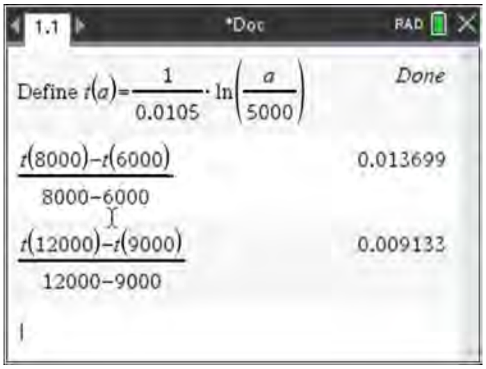
PTS: 2 REF: 012012aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

9 ANS: 1

$$\frac{N(10)-N(1)}{10-1}\approx -2.03,\ \frac{N(20)-N(10)}{20-10}\approx -1.63,\ \frac{N(25)-N(15)}{25-15}\approx -1.46,\ \frac{N(30)-N(1)}{30-1}\approx -1.64$$

PTS: 2 REF: 061807aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

10 ANS: 3



PTS: 2 REF: 081922aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: logarithmic

11 ANS: 3

$$\log_{0.8}\left(\frac{V}{17000}\right)=t \qquad \frac{17{,}000(0.8)^3-17{,}000(0.8)^1}{3-1}\approx -2450$$

$$0.8^t=\frac{V}{17000}$$

$$V=17000(0.8)^t$$

PTS: 2 REF: 081709aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: logarithmic

12 ANS:

$$\frac{m(4)-m(-1)}{4--1}=\frac{81-1}{5}=16 \quad p(x) \text{ has a greater rate of change}$$

$$\frac{p(4)-p(-1)}{4--1}=16.1\overline{3}$$

PTS: 4 REF: 012534aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

13 ANS:

China: $\frac{P(120)-P(50)}{120-50}\approx 13.5$ India: $\frac{1380-376.3}{120-50}\approx 14.3$ India

PTS: 4 REF: 082433aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

14 ANS:
$\frac{f(4)-f(-2)}{4--2}=\frac{80-1.25}{6}=13.125$ $g(x)$ has a greater rate of change

$\frac{g(4)-g(-2)}{4--2}=\frac{179--49}{6}=38$

PTS: 4 REF: 061636aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

15 ANS:
$\frac{p(8)-p(4)}{8-4}\approx 48.78$

PTS: 2 REF: 081827aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

16 ANS:
$\frac{P(10.5)-P(0)}{10.5-0}\approx 10.76$ fruit flies per day

PTS: 2 REF: 082332aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

17 ANS:
$\frac{V(7)-V(2)}{7-2}\approx 48$

PTS: 2 REF: 012427aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

18 ANS:
$\frac{H(10)-H(2)}{10-2}\approx 11524$ From 2014-2018, the median house price increased \$11524 per year on average.

PTS: 4 REF: 062434aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: exponential

19 ANS: 3

$$\frac{f(7)-f(-7)}{7--7}=\frac{=2^{-0.25(7)}\bullet\sin\left(\frac{\pi}{2}(7)\right)-2^{-0.25(-7)}\bullet\sin\left(\frac{\pi}{2}(-7)\right)}{14}\approx -0.26$$

PTS: 2 REF: 061721aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: trigonometric

20 ANS:
$\frac{13.9-9.4}{4-1}=1.5$ The average rate of change in the number of hours of daylight from January 1-April 1 is 1.5.

PTS: 2 REF: 061925aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: trigonometric

21 ANS:
$\frac{B(11)-B(8)}{11-8} \approx -10.1$ The average monthly high temperature decreases 10.1º each month from August to November.

PTS: 2 REF: 011930aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: trigonometric

22 ANS:
$\frac{B(10)-B(6)}{10-6} \approx -3.88$. The average monthly high temperature decreases about 4º each month from June and October.

PTS: 4 REF: 012336aii NAT: F.IF.B.6 TOP: Rate of Change
KEY: trigonometric

23 ANS: 3
$3i(ai-6i^2) = 3ai^2 - 18i^3 = -3a + 18i$

PTS: 2 REF: 062307aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

24 ANS: 2
$6xi^3(-4xi+5) = -24x^2i^4 + 30xi^3 = -24x^2(1) + 30x(-1) = -24x^2 - 30xi$

PTS: 2 REF: 061704aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

25 ANS: 3
$-3+5i-\left(4+24i-2i-12i^2\right) = -3+5i-(16+22i) = -19-17i$

PTS: 2 REF: 081815aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

26 ANS: 4
$(x-2i)(x-2i) = x^2 - 4xi + 4i^2 = x^2 - 4xi - 4$

PTS: 2 REF: 082202aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

27 ANS: 2
$(2-yi)(2-yi) = 4 - 4yi + y^2i^2 = -y^2 - 4yi + 4$

PTS: 2 REF: 061603aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

28 ANS: 3
$(3k-2i)^2 = 9k^2 - 12ki + 4i^2 = 9k^2 - 12ki - 4$

PTS: 2 REF: 081702aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

29 ANS: 2
$i^2(5x-2i)^2 = -(25x^2 - 20xi - 4)$

PTS: 2 REF: 012512aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

30 ANS: 1

$6-(3x-2i)(3x-2i)=6-\left(9x^2-12xi+4i^2\right)=6-9x^2+12xi+4=-9x^2+12xi+10$

PTS: 2 REF: 061915aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

31 ANS: 3

$(x+3i)^2-(2x-3i)^2=x^2+6xi+9i^2-\left(4x^2-12xi+9i^2\right)=-3x^2+18xi$

PTS: 2 REF: 061805aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

32 ANS: 1

$$(2x-i)^2-(2x-i)(2x+3i)$$
$$(2x-i)[(2x-i)-(2x+3i)]$$
$$(2x-i)(-4i)$$
$$-8xi+4i^2$$
$$-8xi-4$$

PTS: 2 REF: 011911aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

33 ANS: 1

$7-3i+x^2-4xi+4i^2-4i-2x^2=7-7i-x^2-4xi-4=3-x^2-4xi-7i=(3-x^2)-(4x+7)i$

PTS: 2 REF: 012022aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

34 ANS: 4

$x^3-x^2yi-xy^2+x^2yi-xy^2i^2-y^3i=x^3-xy^2-xy^2(-1)-y^3i=x^3-y^3i$

PTS: 2 REF: 062223aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

35 ANS: 4

$5i(2x+3i)-x\sqrt{-9}=10xi+15i^2-3xi=-15+7xi$

PTS: 2 REF: 082415aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

36 ANS: 3

$$(6-ki)^2=27-36i$$
$$36-12ki+k^2i^2=27-36i$$
$$9-k^2-12ki=-36i$$

Set real part equal to real part: $9-k^2=0$ Set imaginary part equal to imaginary part: $-12ki=-36i$

$k=\pm 3$

$$\frac{-12ki}{-12i}=\frac{-36i}{-12i}$$
$$k=3$$

PTS: 2 REF: 012308aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

37 ANS:
$xi(-6i)^2 = xi(36i^2) = 36xi^3 = -36xi$

PTS: 2 REF: 081627aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

38 ANS:
$(5xi^3 - 4i)^2 = (-5xi - 4i)^2 = 25x^2i^2 + 40xi^2 + 16i^2 = -25x^2 - 40x - 16$

PTS: 2 REF: 082329aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

39 ANS:
$\left(2xi^3 - 3y\right)^2 = 4x^2i^6 - 12xyi^3 + 9y^2 = -4x^2 + 12xyi + 9y^2$

PTS: 2 REF: 012431aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

40 ANS:
$(1-i)(1-i)(1-i) = (1-2i+i^2)(1-i) = -2i(1-i) = -2i + 2i^2 = -2-2i$

PTS: 2 REF: 011725aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

41 ANS:
$3x - 2x^2i + 6i - 4xi^2 + 2x^2i = 3x + 6i + 4x = 7x + 6i$

PTS: 2 REF: 062425aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

42 ANS:
$(4-3i)(5+2yi-5+2yi)$

$(4-3i)(4yi)$

$16yi - 12yi^2$

$12y + 16yi$

PTS: 2 REF: spr1506aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

43 ANS:
$-\frac{1}{2}i^3(3i-4) - 3i^2 = -\frac{3}{2}i^4 + 2i^3 - 3i^2 = -\frac{3}{2} - 2i + 3 = \frac{3}{2} - 2i$

PTS: 2 REF: 081927aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

44 ANS:
$i^2 = -1$, and not 1; $10 + 10i$

PTS: 2 REF: 011825aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

45 ANS: 4

$$4x^2 = -98$$

$$x^2 = -\frac{98}{4}$$

$$x^2 = -\frac{49}{2}$$

$$x = \pm\sqrt{-\frac{49}{2}} = \pm\frac{7i}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \pm\frac{7i\sqrt{2}}{2}$$

PTS: 2 REF: 061707aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | taking square roots

46 ANS: 4

$$wx^2 + w = 0$$

$$w(x^2 + 1) = 0$$

$$x^2 = -1$$

$$x = \pm i$$

PTS: 2 REF: 061912aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | taking square roots

47 ANS: 3

$$x^2 + 2x + 1 = -5 + 1$$

$$(x+1)^2 = -4$$

$$x + 1 = \pm 2i$$

$$x = -1 \pm 2i$$

PTS: 2 REF: 081703aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | completing the square

48 ANS: 3

$$x^2 + 6x + 9 = -10 + 9$$

$$(x+3)^2 = -1$$

$$x + 3 = \pm i$$

$$x = -3 \pm i$$

PTS: 2 REF: 012416aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | completing the square

49 ANS: 1

$$x^2 - 4x + 4 = -13 + 4$$
$$(x-2)^2 = -9$$
$$x - 2 = \pm 3i$$
$$x = 2 \pm 3i$$

PTS: 2 REF: 062312aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | completing the square

50 ANS: 3

$$-2\left(-\frac{1}{2}x^2 = -6x + 20\right)$$
$$x^2 - 12x = -40$$
$$x^2 - 12x + 36 = -40 + 36$$
$$(x-6)^2 = -4$$
$$x - 6 = \pm 2i$$
$$x = 6 \pm 2i$$

PTS: 2 REF: fall1504aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | completing the square

51 ANS: 1

$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(2)}}{2(2)} = \frac{-3 \pm \sqrt{-7}}{4} = -\frac{3}{4} \pm \frac{i\sqrt{7}}{4}$$

PTS: 2 REF: 061612aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

52 ANS: 3

$$x = \frac{-2 \pm \sqrt{2^2 - 4(3)(7)}}{2(3)} = \frac{-2 \pm \sqrt{-80}}{6} = \frac{-2 \pm i\sqrt{16}\sqrt{5}}{6} = -\frac{1}{3} \pm \frac{2i\sqrt{5}}{3}$$

PTS: 2 REF: 081809aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

53 ANS: 2

$$4x^2 - 7x + 8 = 0 \quad x = \frac{7 \pm \sqrt{(-7)^2 - 4(4)(8)}}{2(4)} = \frac{7 \pm \sqrt{-79}}{8}$$

PTS: 2 REF: 012507aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

54 ANS: 2

$$x=\frac{2\pm\sqrt{(-2)^2-4(5)(4)}}{2(5)}=\frac{2\pm\sqrt{-76}}{10}=\frac{2\pm i\sqrt{4}\sqrt{19}}{10}=\frac{1}{5}\pm\frac{i\sqrt{19}}{5}$$

PTS: 2 REF: 011905aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

55 ANS: 4

$$x=\frac{8\pm\sqrt{(-8)^2-4(6)(29)}}{2(6)}=\frac{8\pm\sqrt{-632}}{12}=\frac{8\pm i\sqrt{4}\sqrt{158}}{12}=\frac{2}{3}\pm\frac{1}{6}i\sqrt{158}$$

PTS: 2 REF: 011711aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

56 ANS: 2

$$3x^2-4x+2=2x-3 \quad x=\frac{6\pm\sqrt{(-6)^2-4(3)(5)}}{2(3)}=\frac{6\pm\sqrt{-24}}{6}=\frac{6\pm 2i\sqrt{6}}{6}=1\pm\frac{i\sqrt{6}}{3}$$

$$3x^2-6x+5=0$$

PTS: 2 REF: 062410aii NAT: A.REI.B.4 TOP: Solving Quadratics

57 ANS: 2

$$5x^2-4x+2=0 \quad \frac{4\pm\sqrt{(-4)^2-4(5)(2)}}{2(5)}=\frac{4\pm\sqrt{-24}}{10}=\frac{4\pm 2i\sqrt{6}}{10}=\frac{2\pm i\sqrt{6}}{5}$$

PTS: 2 REF: 012020aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

58 ANS:

$$x=\frac{-3\pm\sqrt{3^2-4(1)(11)}}{2(1)}=\frac{-3\pm\sqrt{-35}}{2}-\frac{3}{2}\pm\frac{i\sqrt{35}}{2}$$

PTS: 2 REF: 082432aii NAT: A.REI.B.4 TOP: Solving Quadratics

59 ANS:

$$x=\frac{-5\pm\sqrt{5^2-4(2)(8)}}{2(2)}=-\frac{5}{4}\pm\frac{i\sqrt{39}}{4}$$

PTS: 2 REF: 061827aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

60 ANS:

$$x=\frac{-5\pm\sqrt{5^2-4(3)(8)}}{2(3)}=-\frac{5}{6}\pm\frac{i\sqrt{71}}{6}$$

PTS: 2 REF: 082327aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | quadratic formula

61 ANS:

$x^2 - 6x = -17$ The solution is imaginary because the parabola and line do not intersect.

$x^2 - 6x + 9 = -17 + 9$

$(x-3)^2 = -8$

$x - 3 = \pm 2i\sqrt{2}$

$x = 3 \pm 2i\sqrt{2}$

PTS: 4 REF: 081936aii NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: complex solutions | completing the square

62 ANS: 2
1) 1 real, mult. 2; 3) not a quadratic; 4) not a function.

PTS: 2 REF: 012324aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

63 ANS: 2 PTS: 2 REF: 012402aii NAT: A.REI.B.4
TOP: Using the Discriminant KEY: determine nature of roots

64 ANS: 3 PTS: 2 REF: 062409aii NAT: A.REI.B.4
TOP: Using the Discriminant KEY: determine nature of roots

65 ANS: 2 PTS: 2 REF: 082308aii NAT: A.REI.B.4
TOP: Using the Discriminant KEY: determine nature of roots

66 ANS: 4
(1) quadratic has two roots and both are real $(-2,0)$ and $(-0.5,0)$, (2) $x = \pm\sqrt{32} - 3$, (3) the real root is 3, with a multiplicity of 2, (4) $x = \pm 4i$

PTS: 2 REF: 011909aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

67 ANS:
$b^2 - 4ac = (-4)^2 - 4(1)(13) = 16 - 52 = -36$ imaginary

PTS: 2 REF: 062225aii NAT: A.REI.B.4 TOP: Using the Discriminant
KEY: determine nature of roots

68 ANS: 1

The product of the roots equals $(3+i)(3-i) = 9 - i^2 = 10 = \frac{c}{a}$. OR

$$(x-(3+i))(x-(3-i)) = 0$$
$$(x-3-i)(x-3+i) = 0$$
$$((x-3)-i)((x-3)+i) = 0$$
$$(x-3)^2 - i^2 = 0$$
$$x^2 - 6x + 9 + 1 = 0$$
$$x^2 - 6x + 10 = 0$$

PTS: 2 REF: 082208aii NAT: A.REI.B.4 TOP: Complex Conjugate Root Theorem

69 ANS: 4

If $1-i$ is one solution, the other is $1+i$.

$$(x-(1-i))(x-(1+i)) = 0$$
$$x^2 - x - ix - x + ix + (1-i^2) = 0$$
$$x^2 - 2x + 2 = 0$$

PTS: 2 REF: 081601aii NAT: A.REI.B.4 TOP: Complex Conjugate Root Theorem

70 ANS: 4

The vertex is $(2,2)$ and $p = 3$. $3+2=5$

PTS: 2 REF: 081823aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

71 ANS: 1

In vertex form, the parabola is $y = \frac{1}{4(2)}(x+5)^2 - 2$. The vertex is $(-5,-2)$ and $p = 2$. $2 + -2 = 0$

PTS: 2 REF: 082416aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

72 ANS: 1

The vertical distance from the directrix to the vertex, *p*, is 2. The vertical distance from the vertex to the focus must also be 2.

PTS: 2 REF: 062213aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

73 ANS: 1

In vertex form, the parabola is $y = -\frac{1}{4(2)}(x+4)^2 + 3$. The vertex is $(-4,3)$ and $p = 2$. $3+2=5$

PTS: 2 REF: 011816aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

74 ANS: 3

$\dfrac{12(y+1)}{12}=\dfrac{(x-4)^2}{12}$ The vertex is $(4,-1)$ and $p=3$, so the focus is $(4,2)$. $y=-1-3=-4$

$$y=\frac{1}{4(3)}(x-4)^2-1$$

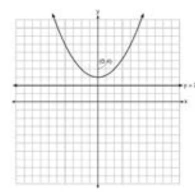
PTS: 2 REF: 062423aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

75 ANS: 4

The vertex is $(2,-1)$ and $p=2$. $y=-\dfrac{1}{4(2)}(x-2)^2-1$

PTS: 2 REF: 081619aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

76 ANS: 4

A parabola with a focus of $(0,4)$ and a directrix of $y=2$ is sketched as follows:  By inspection, it is determined that the vertex of the parabola is $(0,3)$. It is also evident that the distance, p, between the vertex and the focus is 1. It is possible to use the formula $(x-h)^2=4p(y-k)$ to derive the equation of the parabola as follows: $(x-0)^2=4(1)(y-3)$

$$x^2=4y-12$$

$$x^2+12=4y$$

$$\frac{x^2}{4}+3=y$$

or A point (x,y) on the parabola must be the same distance from the focus as it is from the directrix. For any such point (x,y), the distance to the focus is $\sqrt{(x-0)^2+(y-4)^2}$ and the distance to the directrix is $y-2$. Setting this equal leads to: $x^2+y^2-8y+16=y^2-4y+4$

$$x^2+16=4y+4$$

$$\frac{x^2}{4}+3=y$$

PTS: 2 REF: spr1502aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

77 ANS: 4

The vertex is $(1,0)$ and $p=2$. $y=\dfrac{1}{4(2)}(x-1)^2+0$

PTS: 2 REF: 061717aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

78 ANS: 2

The vertex of the parabola is $(0,0)$. The distance, p, between the vertex and the focus or the vertex and the directrix is 1. $y = \frac{-1}{4p}(x-h)^2 + k$

$$y = \frac{-1}{4(1)}(x-0)^2 + 0$$

$$y = -\frac{1}{4}x^2$$

PTS: 2 REF: 081706aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

79 ANS: 4

$\frac{5+9}{2} = 7$, 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 NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

80 ANS: 3

The vertex is $(-3,5)$ and $p = 2$. $y = \frac{-1}{4(2)}(x+3)^2 + 5$

PTS: 2 REF: 011914aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

81 ANS: 3

The distance from the vertex to the focus, p, is 4. Since the focus is below the vertex, p is negative.

$y = -\frac{1}{4(4)}(x-2)^2 + 1$

PTS: 2 REF: 082212aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

82 ANS: 4

The distance between the focus and directrix is $1 - -3 = 4$. p is half this distance, or 2. The vertex of the parabola is $(4,-1)$. Since the directrix is above the focus, the parabola faces downward. $y = -\frac{1}{4p}(x-h)^2 + k$

$$y = -\frac{1}{4(2)}(x-4)^2 - 1$$

$$y + 1 = -\frac{1}{8}(x-4)^2$$

PTS: 2 REF: 012322aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

83 ANS: 2

Since the distance from the focus to the directrix is 2, $p = 1$ and the vertex of the parabola is $(0,5)$.

$$y = \frac{1}{4p}(x-h)^2 + k$$

$$y = \frac{1}{4(1)}(x-0)^2 + 5$$

$$y = \frac{1}{4}x^2 + 5$$

$$y - 5 = \frac{1}{4}x^2$$

$$4(y-5) = x^2$$

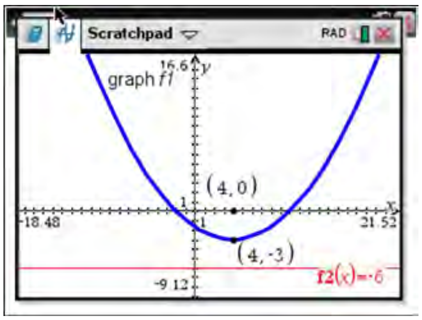
PTS: 2 REF: 062323aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

84 ANS: 1

Distance from the focus to the directrix is 2, so $p = 1$. Vertex is $(-3,1)$. $y = \frac{1}{4(1)}(x+3)^2 + 1$

PTS: 2 REF: 012409aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

85 ANS:



The vertex of the parabola is $(4,-3)$. The x-coordinate of the focus and the vertex is the same. Since the distance from the vertex to the directrix is 3, the distance from the vertex to the focus is 3, so the y-coordinate of the focus is 0. The coordinates of the focus are $(4,0)$.

PTS: 2 REF: 061630aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

86 ANS:

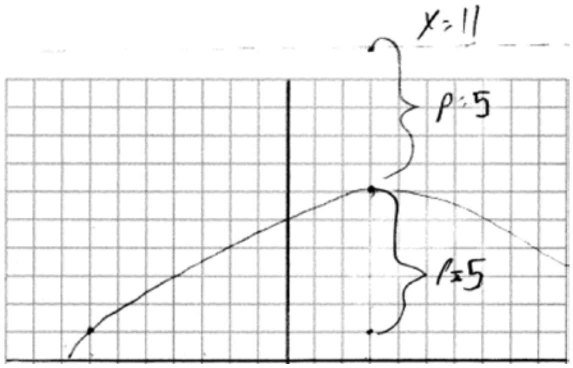
p is the distance from the focus to the vertex: $8 - 7 = 1$. p is the distance from the directrix to the vertex:

$1 = 7 - d$. $y = 6$

$d = 6$

PTS: 2 REF: 082330aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

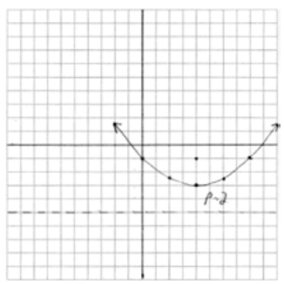
87 ANS:



vertex $(3,6)$, focus $(3,1)$, $p=5$, directrix $y=6+5=11$

PTS: 2 REF: 012028aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

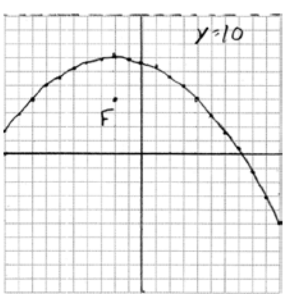
88 ANS:

$y=\frac{1}{4(2)}(x-4)^2-3$  $y=\frac{-1+-5}{2}=-3$. The vertex is $(4,-3)$ and $p=2$.

PTS: 4 REF: 061935aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

89 ANS:

$\frac{10-4}{2}=7$, so the vertex is $(-2,7)$ and $p=3$. $y=-\frac{1}{4(3)}(x+2)^2+7=y=-\frac{1}{12}(x+2)^2+7$



PTS: 4 REF: 012535aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

90 ANS: 2

$$
\begin{aligned}
u=x+2 \qquad & u^2+4u+3 \\
& (u+3)(u+1) \\
& (x+2+3)(x+2+1) \\
& (x+5)(x+3)
\end{aligned}
$$

PTS: 2 REF: 081901aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

91 ANS: 1

$$u = x+2 \qquad u^2 - 5u + 6$$
$$(u-3)(u-2)$$
$$(x+2-3)(x+2-2)$$
$$(x-1)x$$

PTS: 2 REF: 012301aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

92 ANS: 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 NAT: A.SSE.A.2 TOP: Factoring Polynomials

93 ANS: 3

$$(x+a)^2 + 5(x+a) + 4 \quad \text{let } u = x+a$$
$$u^2 + 5u + 4$$
$$(u+4)(u+1)$$
$$(x+a+4)(x+a+1)$$

PTS: 2 REF: 012006aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: multivariable

94 ANS: 2

$$u = x-2 \qquad u^2 + 27u - 90$$
$$(u+30)(u-3)$$
$$(x-2+30)(x-2-3)$$
$$(x+28)(x-5)$$

PTS: 2 REF: 012503aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

95 ANS: 2

$$(x^2+3)^2 - 2(x^2+3) - 24 \quad \text{let } u = x^2+3$$
$$u^2 - 2u - 24$$
$$(u-6)(u+4)$$
$$(x^2+3-6)(x^2+3+4)$$

PTS: 2 REF: 062310aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

96 ANS: 2 PTS: 2 REF: 081904aii NAT: A.SSE.A.2
TOP: Factoring Polynomials KEY: higher power

97 ANS: 4
$m^5 + m^3 - 6m = m(m^4 + m^2 - 6) = m(m^2 + 3)(m^2 - 2)$

PTS: 2 REF: 011703aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

98 ANS: 4
$(x^6y^4 - 9)(x^4 - 16)$

$(x^3y^2 + 3)(x^3y^2 - 3)(x^2 + 4)(x^2 - 4)$

PTS: 2 REF: 081814aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

99 ANS: 3 PTS: 2 REF: 062302aii NAT: A.SSE.A.2
TOP: Factoring Polynomials

100 ANS: 3
$x^8 - y^8 = (x^4 + y^4)(x^4 - y^4) = (x^4 + y^4)(x^2 + y^2)(x^2 - y^2) = (x^4 + y^4)(x^2 + y^2)(x + y)(x - y)$

PTS: 2 REF: 082423aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

101 ANS: 2
$x(x^3 + 4x^2 - 9x - 36)$

$x(x^2(x + 4) - 9(x + 4))$

$x(x^2 - 9)(x + 4)$

$x(x + 3)(x - 3)(x + 4)$

PTS: 2 REF: 062407aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

102 ANS: 3
$2d(d^3 + 3d^2 - 9d - 27)$

$2d(d^2(d + 3) - 9(d + 3))$

$2d(d^2 - 9)(d + 3)$

$2d(d + 3)(d - 3)(d + 3)$

$2d(d + 3)^2(d - 3)$

PTS: 2 REF: 081615aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

103 ANS: 4

$k^4 - 4k^2 + 8k^3 - 32k + 12k^2 - 48$

$k^2(k^2 - 4) + 8k(k^2 - 4) + 12(k^2 - 4)$

$(k^2 - 4)(k^2 + 8k + 12)$

$(k + 2)(k - 2)(k + 6)(k + 2)$

PTS: 2 REF: fall1505aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

104 ANS: 2

$n^2\left(n^2 - 9\right) + 4n\left(n^2 - 9\right) - 12\left(n^2 - 9\right)$

$\left(n^2 + 4n - 12\right)\left(n^2 - 9\right)$

$(n + 6)(n - 2)(n + 3)(n - 3)$

PTS: 2 REF: 061911aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

105 ANS: 3

$(m - 2)^2(m + 3) = (m^2 - 4m + 4)(m + 3) = m^3 + 3m^2 - 4m^2 - 12m + 4m + 12 = m^3 - m^2 - 8m + 12$

PTS: 2 REF: 081605aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

106 ANS: 1

1) let $y = x + 2$, then $y^2 + 2y - 8$

$(y + 4)(y - 2)$

$(x + 2 + 4)(x + 2 - 2)$

$(x + 6)x$

PTS: 2 REF: 081715aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: multivariable

107 ANS:

$\left(x^2 - 6\right)\left(x^2 + 2\right)$

PTS: 2 REF: 081825aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: higher power

108 ANS:

$x^4 - 5x^2 + 4$

$(x^2 - 4)(x^2 - 1)$

$(x + 2)(x - 2)(x + 1)(x - 1)$

PTS: 2 REF: 012331aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

109 ANS:
$$x^3-2x^2-9x+18=x^2(x-2)-9(x-2)=\left(x^2-9\right)(x-2)=(x+3)(x-3)(x-2)$$

PTS: 2 REF: 082226aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

110 ANS:
$$x^3+4x^2-9x-36=x^2(x+4)-9(x+4)=\left(x^2-9\right)(x+4)=(x+3)(x-3)(x+4)$$

PTS: 2 REF: 012425aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

111 ANS:
$$2x^3-3x^2-18x+27$$
$$x^2(2x-3)-9(2x-3)$$
$$(x^2-9)(2x-3)$$
$$(x+3)(x-3)(2x-3)$$

PTS: 2 REF: 082325aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

112 ANS:
$$x^2(4x-1)+4(4x-1)=(x^2+4)(4x-1)$$

PTS: 2 REF: 061727aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

113 ANS:
$$2x^4-10x^3+3x^2-15x=x(2x^3-10x^2+3x-15)=x(2x^2(x-5)+3(x-5))=x(2x^2+3)(x-5)$$

PTS: 2 REF: 082427aii NAT: A.SSE.A.2 TOP: Factoring Polynomials

114 ANS:
$$-x(2x^3-x^2-18x+9)$$
$$-x(x^2(2x-1)-9(2x-1))$$
$$-x(x^2-9)(2x-1)$$
$$-x(x+3)(x-3)(2x-1)$$

PTS: 2 REF: 062228aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

115 ANS:
$$3x^3+x^2+3xy+y=x^2(3x+1)+y(3x+1)=\left(x^2+y\right)(3x+1)$$

PTS: 2 REF: 011828aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: factoring by grouping

116 ANS:

The expression is of the form $y^2 - 5y - 6$ or $(y-6)(y+1)$. Let $y = 4x^2 + 5x$:

$\left(4x^2 + 5x - 6\right)\left(4x^2 + 5x + 1\right)$

$(4x-3)(x+2)(4x+1)(x+1)$

PTS: 2 REF: fall1512aii NAT: A.SSE.A.2 TOP: Factoring Polynomials
KEY: a>1

117 ANS: 1

$$\begin{array}{lll} x^3 + 2x^2 - 9x - 18 = 0 & x^3 - 9x + 2x^2 - 18 = 0 & x^3 - 9x + 2x^2 - 18 = 0 \\ x^2(x+2) - 9(x+2) = 0 & x(x^2 - 9) + 2(x^2 - 9) = 0 & x(x^2 - 9) + 2(x^2 - 9) = 0 \\ & & (x+2)(x^2 - 9) = 0 \end{array}$$

PTS: 2 REF: 011903aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

118 ANS: 4

$$m^3 - 2m^2 + 4m - 8 = 0$$

$$m^2(m-2) + 4(m-2) = 0$$

$$\left(m^2 + 4\right)(m-2) = 0$$

PTS: 2 REF: 081821aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

119 ANS: 4

$f(x) = (x+1)(x-1)(x-2) = (x^2 - 1)(x-2) = x^3 - 2x^2 - x + 2$

PTS: 2 REF: 081921aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

120 ANS: 4

1) -1 is also a zero. 2) $x^2(x-a) + 16(x-a) = (x^2 + 16)(x-a)$ a is the only zero. 3) $-a$ is the only zero. 4) $x^2(x-a) - 9(x-a) = (x^2 - 9)(x-a)$.

PTS: 2 REF: 012019aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

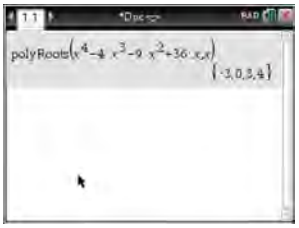
121 ANS: 4 PTS: 2 REF: 081708aii NAT: A.APR.B.3
TOP: Solving Polynomial Equations

122 ANS: 3

$$\begin{array}{r|rrrrr} 3 & 1 & 1 & -3 & 9 & -108 \\ & & 3 & 12 & 27 & 108 \\ \hline & 1 & 4 & 9 & 36 & 0 \end{array} \qquad \begin{array}{c} x^3 + 4x^2 + 9x + 36 = 0 \\ x^2(x+4) + 9(x+4) = 0 \\ (x^2 + 9)(x+4) = 0 \\ x = \pm 3i, -4 \end{array}$$

PTS: 2 REF: 062420aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

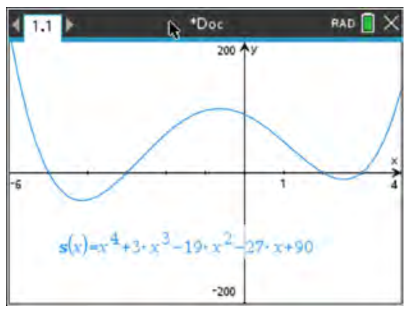
123 ANS: 1



$$x^4 - 4x^3 - 9x^2 + 36x = 0$$
$$x^3(x-4) - 9x(x-4) = 0$$
$$(x^3 - 9x)(x-4) = 0$$
$$x(x^2-9)(x-4) = 0$$
$$x(x+3)(x-3)(x-4) = 0$$
$$x = 0, \pm 3, 4$$

PTS: 2 REF: 061606aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

124 ANS: 4



$$s(x) = x^4 - 9x^2 + 3x^3 - 27x - 10x^2 + 90$$
$$= x^2(x^2-9) + 3x(x^2-9) - 10(x^2-9)$$
$$= (x^2 + 3x - 10)(x^2 - 9)$$
$$= (x+5)(x-2)(x+3)(x-3)$$

PTS: 2 REF: 062303aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

125 ANS: 2

3	1	-1	-21	45	0
		3	6	-45	0
	1	2	-15	0	0

$$x^3 + 2x^2 - 15x = 0$$
$$x(x^2 + 2x - 15) = 0$$
$$x(x+5)(x-3) = 0$$
$$x = 0, -5, 3$$

PTS: 2 REF: 012403aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

126 ANS:

$$3(x^3 + 4x^2 - x - 4) = 0$$
$$(x^2(x+4) - (x+4)) = 0$$
$$(x^2 - 1)(x+4) = 0$$
$$x = \pm 1, -4$$

PTS: 2 REF: 012325aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

127 ANS:

$$0 = 6(-5)^3 + b(-5)^2 - 52(-5) + 15 \quad z(x) = 6x^3 + 19x^2 - 52x + 15$$
$$0 = -750 + 25b + 260 + 15$$
$$475 = 25b$$
$$19 = b$$

-5	6	19	-52	15
		-30	55	15
	6	-11	3	0

$$6x^2 - 11x + 3 = 0$$
$$(2x-3)(3x-1) = 0$$
$$x = \frac{3}{2}, \frac{1}{3}, -5$$

PTS: 4 REF: fall1515aii NAT: A.APR.B.3 TOP: Solving Polynomial Equations

128 ANS: 2 PTS: 2 REF: 082324aii NAT: A.APR.B.3
TOP: Graphing Polynomial Functions

129 ANS: 1 PTS: 2 REF: 061701aii NAT: A.APR.B.3
TOP: Graphing Polynomial Functions

130 ANS: 4 PTS: 2 REF: 061921aii NAT: A.APR.B.3
TOP: Graphing Polynomial Functions

131 ANS: 1 PTS: 2 REF: 012405aii NAT: A.APR.B.3
TOP: Graphing Polynomial Functions

132 ANS: 1

$x^2 + 2x + 1 = (x+1)^2$

PTS: 2 REF: 011919aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

133 ANS: 1

The zeros of the polynomial are at $-b$, and c. The sketch of a polynomial of degree 3 with a negative leading coefficient should have end behavior showing as x goes to negative infinity, $f(x)$ goes to positive infinity. The multiplicities of the roots are correctly represented in the graph.

PTS: 2 REF: spr1501aii NAT: A.APR.B.3 TOP: Graphing Polynomial Functions
KEY: bimodalgraph

134 ANS: 3
The graph shows three real zeros, and has end behavior matching the given end behavior.

PTS: 2 REF: 061604aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions
KEY: bimodalgraph

135 ANS: 2 PTS: 2 REF: 061816aii NAT: F.IF.B.4
TOP: Graphing Polynomial Functions KEY: bimodalgraph

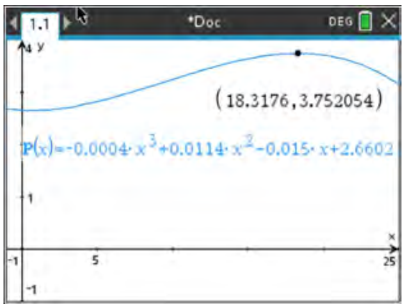
136 ANS: 1 PTS: 2 REF: 082414aii NAT: F.IF.B.4
TOP: Graphing Polynomial Functions

137 ANS: 4 PTS: 2 REF: 082318aii NAT: F.IF.B.4
TOP: Graphing Polynomial Functions

138 ANS: 3 PTS: 2 REF: 012005aii NAT: F.IF.B.4
TOP: Graphing Polynomial Functions

139 ANS: 2 PTS: 2 REF: 061620aii NAT: F.IF.B.4
TOP: Graphing Polynomial Functions

140 ANS: 2



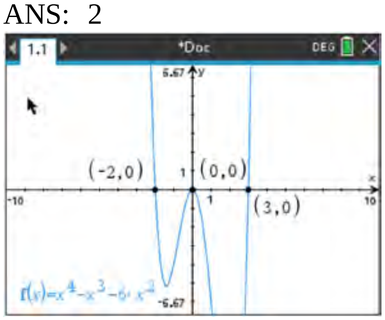
PTS: 2 REF: 012414aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

141 ANS: 2
1) $x \to \infty, f(x) \to \infty$; 3) quartic polynomial; 4) three real roots

PTS: 2 REF: 012318aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

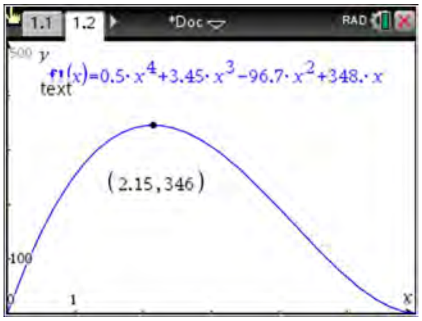
142 ANS: 2 PTS: 2 REF: 081908aii NAT: F.IF.B.4
TOP: Graphing Polynomial Functions

143 ANS: 2



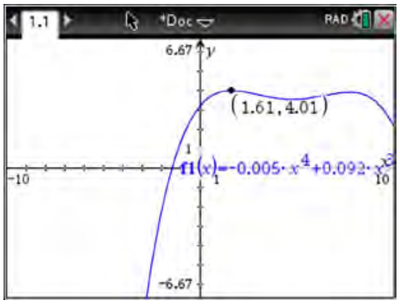
PTS: 2 REF: 012316aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

144 ANS: 1



PTS: 2 REF: 011908aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

145 ANS: 3



PTS: 2 REF: 011817aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

146 ANS: 4

The maximum volume of $p(x)=-(x+2)(x-10)(x-14)$ is about 56, at $x=12.1$

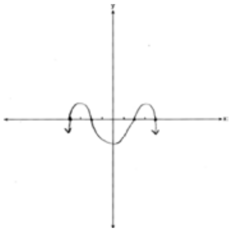
PTS: 2 REF: 081712aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

147 ANS:

$16x^4-81=\left(4x^2+9\right)\left(4x^2-9\right)=\left(4x^2+9\right)(2x+3)(2x-3)$. No, because $\pm\frac{3i}{2}$ are roots.

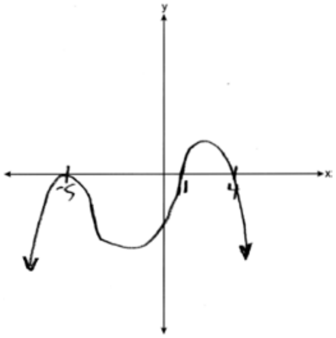
PTS: 4 REF: 061933aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

148 ANS:



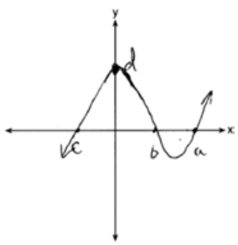
PTS: 2 REF: 011926aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

149 ANS:



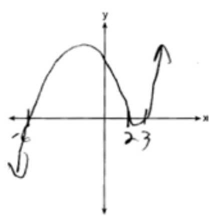
PTS: 2 REF: 062428aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

150 ANS:



PTS: 2 REF: 081732aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

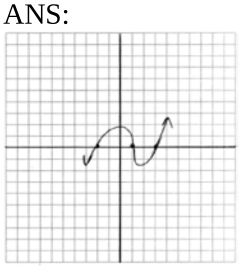
151 ANS:



$p(x) = (x-2)(x-3)(x+6)$

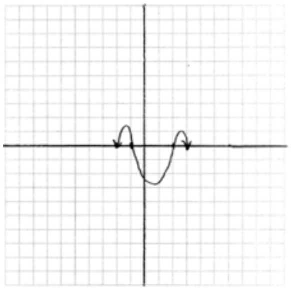
PTS: 4 REF: 062333aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

152 ANS:



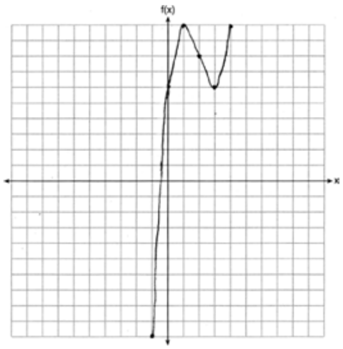
PTS: 2 REF: 011729aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

153 ANS:



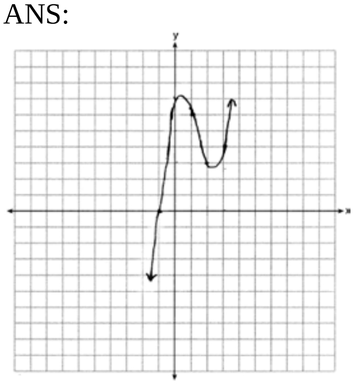
PTS: 2 REF: 011831aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

154 ANS:



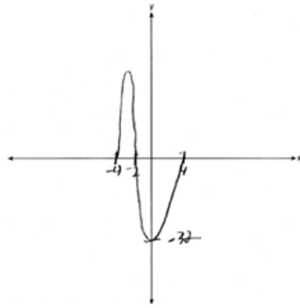
PTS: 2 REF: 061826aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

155 ANS:



PTS: 2 REF: 012032aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

156 ANS:



$$x^3 + 2x^2 - 16x - 32 = 0$$

$$x^2(x+2) - 16(x+2) = 0$$

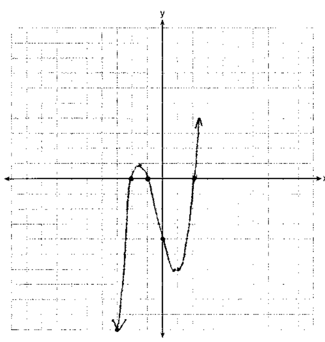
$$(x^2 - 16)(x+2) = 0$$

$$(x+4)(x-4)(x+2) = 0$$

$$x = -4, 4, -2$$

PTS: 4 REF: 012536aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

157 ANS:



$$0 = x^2(x+1) - 4(x+1)$$

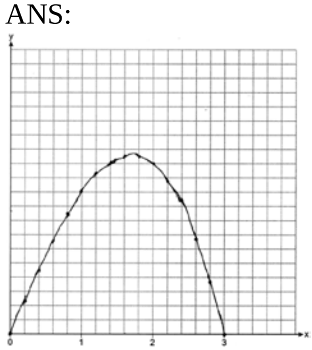
$$0 = (x^2 - 4)(x+1)$$

$$0 = (x+2)(x-2)(x+1)$$

$$x = -2, -1, 2$$

PTS: 4 REF: 081633aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

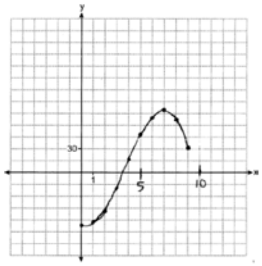
158 ANS:



12.6

PTS: 4 REF: 082234aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

159 ANS:

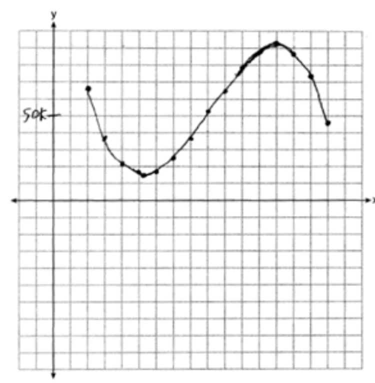


$(7,78)$ If 7000 sweatshirts are sold, the profit is \$78,000. 3,549, because that is when $p(x)$ is first greater than 0.

PTS: 6 REF: 012437aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

160 ANS:

$P(x) = R(x) - C(x) = -330x^3 + 9000x^2 - 67000x + 167000$



Least profitable at year 5 because there is a minimum in $P(x)$. Most profitable at year 13 because there is a maximum in $P(x)$.

PTS: 6 REF: 081837aii NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

161 ANS: 3

Since $x + 4$ is a factor of $p(x)$, there is no remainder.

PTS: 2 REF: 081621aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

162 ANS: 2

$$\begin{array}{r|rrrr} -4 & 1 & -11 & 16 & 84 \\ & & -4 & 60 & -304 \\ \hline & 1 & -15 & 76 & \end{array}$$

Since there is a remainder when the cubic is divided by $x + 4$, this binomial is not a factor.

PTS: 2 REF: 081720aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

163 ANS: 1

$$\begin{array}{r|rrrrr} -2 & 1 & -1 & -11 & 5 & 30 \\ & & -2 & 6 & 10 & -30 \\ \hline & 1 & -3 & -5 & 15 & 0 \end{array}$$

Since there is no remainder when the quartic is divided by $x + 2$, this binomial is a factor.

PTS: 2 REF: 082320aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

164 ANS: 4
$p(2) = 4(2)^3 - 3(2) + 3 = 29$

PTS: 2 REF: 062422aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

165 ANS: 4
$p(5) = 2(5)^3 - 3(5) + 5 = 240$

PTS: 2 REF: 011819aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

166 ANS: 3
$1^3 - k(1)^2 + 2(1) = 0$

$k = 3$

PTS: 2 REF: 061812aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

167 ANS: 1

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & -4 & -4 & 8 \\ & & 2 & 4 & 0 & -8 \\ \hline & 1 & 2 & 0 & -4 & 0 \end{array}$$

Since there is no remainder when the quartic is divided by $x - 2$, this binomial is a factor.

PTS: 2 REF: 061711aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

168 ANS: 3 PTS: 2 REF: 012508aii NAT: A.APR.B.2
TOP: Remainder and Factor Theorems

169 ANS: 4 PTS: 2 REF: 061907aii NAT: A.APR.B.2
TOP: Remainder and Factor Theorems

170 ANS: 2

$2x^3 + x^2 - 18x - 9$

$x^2(2x + 1) - 9(2x + 1)$

$(x^2 - 9)(2x + 1)$

$(x + 3)(x - 3)(2x + 1)$

PTS: 2 REF: 082206aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

171 ANS: 2 PTS: 2 REF: 062206aii NAT: A.APR.B.2
TOP: Remainder and Factor Theorems

172 ANS: 2 PTS: 2 REF: 011720aii NAT: A.APR.B.2
TOP: Remainder and Factor Theorems

173 ANS: 2

$$
\begin{aligned}
2x^4 - x^3 - 16x + 8 &= 0 \\
x^3(2x-1) - 8(2x-1) &= 0 \\
(x^3 - 8)(2x-1) &= 0 \\
x &= 2, \frac{1}{2}
\end{aligned}
$$

PTS: 2 REF: 012307aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

174 ANS: 3

$$
\begin{array}{r|rrrr}
3 & -2 & -11 & -12 & 9 \\
 & & -6 & -51 & -189 \\
\hline
 & -2 & -17 & -63 & -180
\end{array}
$$

$x-3$ is not a factor since there is a remainder.

$$
\begin{array}{r|rrrr}
-2 & -2 & -11 & -12 & 9 \\
 & & 4 & 14 & -4 \\
\hline
 & -2 & -7 & 2 & 5
\end{array}
$$

PTS: 2 REF: 062414aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

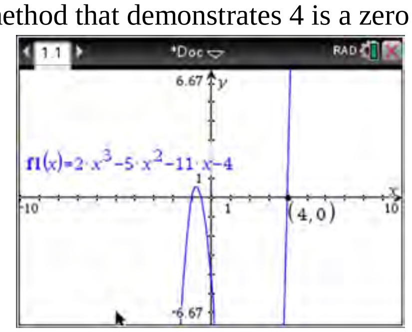
175 ANS:

$m(3) = 3^3 - 3^2 - 5(3) - 3 = 27 - 9 - 15 - 3 = 0$ Since $m(3) = 0$, there is no remainder when $m(x)$ is divided by $x-3$, and so $x-3$ is a factor.

PTS: 2 REF: 012026aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

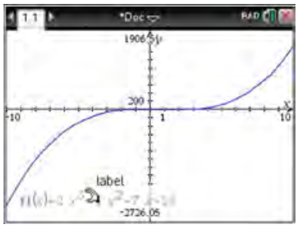
176 ANS:

$f(4) = 2(4)^3 - 5(4)^2 - 11(4) - 4 = 128 - 80 - 44 - 4 = 0$ Any method that demonstrates 4 is a zero of $f(x)$ confirms that $x-4$ is a factor, as suggested by the Remainder Theorem.



PTS: 2 REF: spr1507aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

177 ANS:

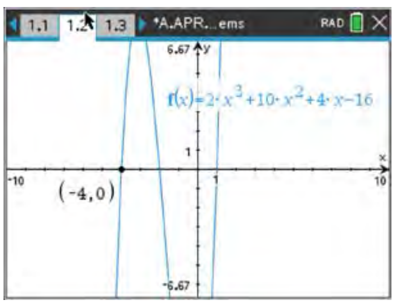


$$\begin{array}{r} 2x^2+6x+23 \\ x-5\overline{)\,2x^3-4x^2-7x-10} \\ \underline{2x^3-10x^2} \\ 6x^2-7x \\ \underline{6x^2-30x} \\ 23x-10 \\ \underline{23x-115} \\ 105 \end{array}$$

Since there is a remainder, $x-5$ is not a factor.

PTS: 2 REF: 061627aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

178 ANS:



Since -4 is a zero, $x+4$ is a factor.

PTS: 2 REF: 012426aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

179 ANS:

Since there is no remainder when the cubic is divided by $x+3$, this binomial is a factor.

$$\begin{array}{r|rrrr} -3 & 7 & 27 & 9 & -27 \\ & & -21 & -18 & 27 \\ \hline & 7 & 6 & -9 & 0 \end{array}$$

PTS: 2 REF: 082426aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

180 ANS:

$r(2)=-6$. Since there is a remainder when the cubic is divided by $x-2$, this binomial is not a factor.

$$\begin{array}{r|rrrr} 2 & 1 & -4 & 4 & 6 \\ & & 2 & -4 & 0 \\ \hline & 1 & -2 & 0 & -6 \end{array}$$

PTS: 2 REF: 061725aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

181 ANS:
$P(-2) = 60$ $Q(-2) = 0$ $(x + 2)$ is a factor of $Q(x)$ since $Q(-2) = 0$.

PTS: 2 REF: 081929aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

182 ANS:

$$g(3) = 0; \quad \begin{aligned} 0 &= 3^3 + a(3)^2 - 5(3) + 6 \\ 0 &= 27 + 9a - 15 + 6 \\ -18 &= 9a \\ a &= -2 \end{aligned}$$

PTS: 2 REF: 062328aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

183 ANS:
$j(-1) = 2(-1)^4 - (-1)^3 - 35(-1)^2 + 16(-1) + 48 = 2 + 1 - 35 - 16 + 48 = 0$; $x + 1$ is a factor of $j(x)$;

$$2x^3 - 3x^2 - 32x + 48 = 0$$

$$x^2(2x - 3) - 16(2x - 3) = 0$$

$$\left(x^2 - 16\right)(2x - 3) = 0$$

$$x = \pm 4, \frac{3}{2}$$

PTS: 4 REF: 081834aii NAT: A.APR.B.2 TOP: Remainder and Factor Theorems

184 ANS: 3 PTS: 2 REF: 012003aii NAT: A.APR.C.4
TOP: Polynomial Identities

185 ANS: 2 PTS: 2 REF: 011806aii NAT: A.APR.C.4
TOP: Polynomial Identities

186 ANS: 4
$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$

PTS: 2 REF: 012417aii NAT: A.APR.C.4 TOP: Polynomial Identities

187 ANS: 4
$(x - y)^2 = x^2 - 2xy + y^2$ $(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$

PTS: 2 REF: 061902aii NAT: A.APR.C.4 TOP: Polynomial Identities

188 ANS: 1
$(2x - 3)^2 = 4x^2 - 12x + 9$ $(x - 2)^3 = (x - 2)(x - 2)^2 = (x - 2)(x^2 - 4x + 4)$

$s = 4$ $s = -4$ and 4

PTS: 2 REF: 062405aii NAT: A.APR.C.4 TOP: Polynomial Identities

189 ANS: 4
$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3 \neq x^3 + 3xy + y^3$

PTS: 2 REF: 081620aii NAT: A.APR.C.4 TOP: Polynomial Identities

190 ANS: 2 PTS: 2 REF: 012311aii NAT: A.APR.C.4
TOP: Polynomial Identities

191 ANS: 2

1) $x^4 - 2x^2y^2 + y^4 + 4x^2y^2$; 3) $x^4 + 2x^2y^2 + y^4$; 4) $4x^4 + 4x^2y^2 + y^4 - 3x^4 - 2x^2y^2$

PTS: 2 REF: 012522aii NAT: A.APR.C.4 TOP: Polynomial Identities

192 ANS: 1

$$x^4 + x$$

$$x(x^3 + 1)$$

$$x(x+1)(x^2 - x + 1)$$

$$(x+1)(x^3 - x^2 + x)$$

PTS: 2 REF: 082404aii NAT: A.APR.C.4 TOP: Polynomial Identities

193 ANS: 4

$$(x^2 - y^2) + (2xy)^2 = x^2 + 4x^2y^2 - y^2$$

$$(x - y) + (x^2 - xy + y^2) = x^2 + x - y - xy + y^2$$

$$(x-y)(x-y)(x^2 + y^2) = (x^2 - 2xy + y^2)(x^2 + y^2) = x^4 - 2x^3y + x^2y^2 + x^2y^2 - 2xy^3 + y^4$$

PTS: 2 REF: 062322aii NAT: A.APR.C.4 TOP: Polynomial Identities

194 ANS: 4

$$(a+b+c)^2 = a^2 + ab + ac + ab + b^2 + bc + ac + ab + c^2$$

$$x = a^2 + b^2 + c^2 + 2(ab + bc + ac)$$

$$x = y + 2z$$

PTS: 2 REF: 061822aii NAT: A.APR.C.4 TOP: Polynomial Identities

195 ANS: 1

2) $(x^4 - x^2y^2 + y^4) \neq (x^2 - y^2)(x^2 - y^2)$; 3) $x^6 + y^6 \neq (x^3 + y^3)^2$; 4) $\dfrac{x^6 + y^6}{x^2 + y^2} \neq x^6 + y^6 - (x^2 + y^2)$

PTS: 2 REF: 082219aii NAT: A.APR.C.4 TOP: Polynomial Identities

196 ANS:

Let x equal the first integer and $x+1$ equal the next. $(x+1)^2 - x^2 = x^2 + 2x + 1 - x^2 = 2x + 1$. $2x + 1$ is an odd integer.

PTS: 2 REF: fall1511aii NAT: A.APR.C.4 TOP: Polynomial Identities

197 ANS:

$$(x^2+y^2)^2=(x^2-y^2)^2+(2xy)^2$$
$$x^4+2x^2y^2+y^4=x^4-2x^2y^2+y^4+4x^2y^2$$
$$x^4+2x^2y^2+y^4=x^4+2x^2y^2+y^4$$

PTS: 2 REF: 081727aii NAT: A.APR.C.4 TOP: Polynomial Identities

198 ANS:

$$(a+b)^3=a^3+b^3$$

No. Erin's shortcut only works if $a=0$, $b=0$ or $a=-b$.

$$a^3+3a^2b+3ab^2+b^3=a^3+b^3$$
$$3ab^2+3a^2b=0$$
$$3ab(b+a)=0$$
$$a=0, b=0, a=-b$$

PTS: 2 REF: 011927aii NAT: A.APR.C.4 TOP: Polynomial Identities

199 ANS:

$$2x^3-10x^2+11x-7=2x^3+hx^2+3x-8x^2-4hx-12+k$$
$$-2x^2+8x+5=hx^2-4hx+k$$

$h=-2$

$k=5$

PTS: 4 REF: 011733aii NAT: A.APR.C.4 TOP: Polynomial Identities

Algebra II Regents Exam Questions by State Standard: Topic
Answer Section

200 ANS:
The denominator of the rational exponent represents the index of a root, and the 4th root of 81 is 3 and 3^3 is 27.

PTS: 2 REF: 011832aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

201 ANS:
Rewrite $\frac{4}{3}$ as $\frac{1}{3}\cdot\frac{4}{1}$, using the power of a power rule.

PTS: 2 REF: 081725aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

202 ANS:
Applying the commutative property, $\left(3^{\frac{1}{5}}\right)^2$ can be rewritten as $\left(3^2\right)^{\frac{1}{5}}$ or $9^{\frac{1}{5}}$. A fractional exponent can be rewritten as a radical with the denominator as the index, or $9^{\frac{1}{5}} = \sqrt[5]{9}$.

PTS: 2 REF: 081626aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

203 ANS:
The denominator of the rational exponent represents the index of a root, and the numerator of the rational exponent represents the power of the base. $\left(\sqrt{9}\right)^5 = 243$

PTS: 2 REF: 081926aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

204 ANS: 1 PTS: 2 REF: 062201aii NAT: N.RN.A.2
TOP: Radicals and Rational Exponents

205 ANS: 1
$$8^{\frac{x}{2}} \bullet 8^{\frac{x}{3}} = 8^{\frac{5x}{6}} = \sqrt[6]{8^{5x}}$$

PTS: 2 REF: 082419aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

206 ANS: 2
$$a\sqrt[5]{a^4} = a^{\frac{5}{5}} \cdot a^{\frac{4}{5}} = a^{\frac{9}{5}}$$

PTS: 2 REF: 062306aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

207 ANS: 1
$$2xy^2\sqrt[3]{x^2y} = 2x^{\frac{3}{3}}y^{\frac{6}{3}}x^{\frac{2}{3}}y^{\frac{1}{3}} = 2x^{\frac{5}{3}}y^{\frac{7}{3}}$$

PTS: 2 REF: 062413aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

208 ANS: 1

$$\sqrt[4]{81x^8y^6} = 81^{\frac{1}{4}}x^{\frac{8}{4}}y^{\frac{6}{4}} = 3x^2y^{\frac{3}{2}}$$

PTS: 2 REF: 012001aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

209 ANS: 3

$$\sqrt{x} \bullet \sqrt[4]{x^{11}} = x^{\frac{1}{2}} \bullet x^{\frac{11}{4}} = x^{\frac{2}{4}} \bullet x^{\frac{11}{4}} = x^{\frac{13}{4}}$$

PTS: 2 REF: 012511aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

210 ANS: 3

$$\frac{x^{\frac{1}{5}}}{x^{\frac{1}{2}}} = x^{\frac{1}{5}-\frac{1}{2}} = x^{-\frac{3}{10}} = \frac{1}{x^{\frac{3}{10}}} = \frac{1}{\sqrt[10]{x^3}}$$

PTS: 2 REF: 012312aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

211 ANS: 4

$$\frac{n}{m} = \frac{\sqrt{a^5}}{a} = \frac{a^{\frac{5}{2}}}{a^{\frac{2}{2}}} = a^{\frac{3}{2}} = \sqrt{a^3}$$

PTS: 2 REF: 011811aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

212 ANS: 2

$$\left(\frac{1}{x^{-2}}\right)^{-\frac{3}{4}} = \frac{1}{x^{\frac{3}{2}}} = \frac{1}{x^{\frac{2}{2}} \cdot x^{\frac{1}{2}}} = \frac{1}{x\sqrt{x}}$$

PTS: 2 REF: 082412aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

213 ANS: 2

$$\left(m^{\frac{5}{3}}\right)^{-\frac{1}{2}} = m^{-\frac{5}{6}} = \frac{1}{\sqrt[6]{m^5}}$$

PTS: 2 REF: 011707aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

214 ANS: 4 PTS: 2 REF: 061601aii NAT: N.RN.A.2
TOP: Radicals and Rational Exponents KEY: variables

215 ANS: 3

$$P = 210x^{\frac{4}{3}}y^{\frac{7}{3}} = 210x^{\frac{3}{3}}x^{\frac{1}{3}}y^{\frac{6}{3}}y^{\frac{1}{3}} = 210x \cdot x^{\frac{1}{3}}y^2y^{\frac{1}{3}} = 210xy^2\sqrt[3]{xy}$$

PTS: 2 REF: 012413aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

216 ANS: 4

$$\left(\frac{-54x^9}{y^4}\right)^{\frac{2}{3}} = \frac{(2\cdot -27)^{\frac{2}{3}}x^{\frac{18}{3}}}{y^{\frac{8}{3}}} = \frac{2^{\frac{2}{3}}\cdot 9x^6}{y^2\cdot y^{\frac{2}{3}}} = \frac{9x^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$$

PTS: 2 REF: 081723aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

217 ANS: 3

$$\frac{x^{\frac{2}{3}}\bullet x^{\frac{5}{2}}}{x^{\frac{1}{6}}} = \frac{x^{\frac{4}{6}}\bullet x^{\frac{15}{6}}}{x^{\frac{1}{6}}} = x^{\frac{18}{6}} = x^3$$

PTS: 2 REF: 081812aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

218 ANS: 4 PTS: 2 REF: 061716aii NAT: N.RN.A.2
TOP: Radicals and Rational Exponents KEY: variables

219 ANS: 4

$$\text{I. }\left(\frac{y}{x^3}\right)^{-1} = \frac{x^3}{y};\ \text{ II. }\sqrt[3]{x^9}\,(y^{-1}) = \frac{x^{\frac{9}{3}}}{y} = \frac{x^3}{y};\ \text{ III. }\frac{x^6\sqrt[4]{y^8}}{x^3y^3} = \frac{x^3y^{\frac{8}{4}}}{y^3} = \frac{x^3}{y}$$

PTS: 2 REF: 062320aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

220 ANS: 1

$$(x^{\frac{3}{2}})^2 = x^3$$

PTS: 2 REF: 061908aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

221 ANS: 1

$$\left(a\sqrt[3]{2b^2}\right)\left(\sqrt[3]{4a^2b}\right) = a\sqrt[3]{8a^2b^3} = 2ab\sqrt[3]{a^2}$$

PTS: 2 REF: 082213aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

222 ANS: 4

$$\sqrt{3x^2y}\bullet\sqrt[3]{27x^3y^2} = 3^{\frac{1}{2}}xy^{\frac{1}{2}}\bullet 3^{\frac{2}{2}}xy^{\frac{2}{3}} = 3^{\frac{3}{2}}x^2y^{\frac{7}{6}}$$

PTS: 2 REF: 081914aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

223 ANS: 2

$$4x \bullet x^{\frac{2}{3}} + 2x^{\frac{5}{3}} = 4x^{\frac{5}{3}} + 2x^{\frac{5}{3}} = 6x^{\frac{5}{3}} = 6\sqrt[3]{x^5}$$

PTS: 2 REF: 061820aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

224 ANS:

$$\sqrt[3]{x} \bullet \sqrt{x} = x^{\frac{1}{3}} \bullet x^{\frac{1}{2}} = x^{\frac{2}{6}} \bullet x^{\frac{3}{6}} = x^{\frac{5}{6}}$$

PTS: 2 REF: 061731aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

225 ANS:

No. $\left(\sqrt[7]{x^2}\right)\left(\sqrt[5]{x^3}\right) = x^{\frac{2}{7}} \cdot x^{\frac{3}{5}} = x^{\frac{31}{35}} = \sqrt[35]{x^{31}}$

PTS: 2 REF: 061929aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

226 ANS:

$$\left(p^2 n^{\frac{1}{2}}\right)^8 \sqrt{p^5 n^4} = \left(p^{16} n^4\right) p^2 n^2 \sqrt{p} = p^{18} n^6 \sqrt{p}$$

PTS: 2 REF: 012025aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

227 ANS:

$$\left(\frac{1}{\sqrt[3]{y^2}}\right) y^4 = \frac{y^{\frac{12}{3}}}{y^{\frac{2}{3}}} = y^{\frac{10}{3}} \qquad n = \frac{10}{3}$$

PTS: 2 REF: 012428aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

228 ANS:

$$\frac{x \cdot x^{\frac{3}{2}}}{x^{\frac{5}{3}}} = \frac{x^{\frac{6}{6}} \cdot x^{\frac{9}{6}}}{x^{\frac{10}{6}}} = x^{\frac{5}{6}}$$

PTS: 2 REF: 082331aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

229 ANS:

$$\frac{x^{\frac{8}{3}}}{x^{\frac{4}{3}}} = x^y$$

$$x^{\frac{4}{3}} = x^y$$

$$\frac{4}{3} = y$$

PTS: 2 REF: spr1505aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: numbers

230 ANS:

$$\frac{\sqrt[5]{a^{10}}}{\left(a^3\right)^{\frac{1}{2}}} = \frac{a^{\frac{10}{5}}}{a^{\frac{3}{2}}} = \frac{a^{\frac{20}{10}}}{a^{\frac{15}{10}}} = a^{\frac{5}{10}} \quad x = \frac{1}{2}$$

PTS: 2 REF: 012528aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

231 ANS:

$$\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}} = \frac{x^{\frac{2}{3}}y^{\frac{5}{3}}}{x^{\frac{3}{4}}y} = \frac{x^{\frac{8}{12}}y^{\frac{20}{12}}}{x^{\frac{9}{12}}y^{\frac{12}{12}}} = x^{-\frac{1}{12}}y^{\frac{2}{3}}$$

PTS: 2 REF: 011925aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

232 ANS:

$$\frac{2x^{\frac{3}{2}}}{2x^{\frac{2}{2}}} = x^{\frac{1}{2}} = \sqrt{x}$$

PTS: 2 REF: 081826aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

233 ANS:

$$\sqrt[3]{81} = \sqrt[3]{3^4} = 3^{\frac{4}{3}} \quad a = \frac{4}{3}$$

PTS: 2 REF: 062230aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

234 ANS:

$$\left(\frac{y^{\frac{17}{8}}}{y^{\frac{10}{8}}}\right)^{-4} = y^n \quad n = -\frac{7}{2}$$

$$\left(y^{\frac{7}{8}}\right)^{-4} = y^n$$

$$y^{-\frac{7}{2}} = y^n$$

PTS: 2 REF: 082228aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

235 ANS:

$$\left(x^{\frac{5}{3}}\right)^{\frac{6}{5}} = \left(y^{\frac{5}{6}}\right)^{\frac{6}{5}}$$

$$x^2 = y$$

PTS: 2 REF: 011730aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents
KEY: variables

236 ANS: 3

$\sqrt{56-x} = x$ –8 is extraneous.

$$56 - x = x^2$$

$$0 = x^2 + x - 56$$

$$0 = (x+8)(x-7)$$

$$x = 7$$

PTS: 2 REF: 061605aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

237 ANS: 2

$x^2 = 3x + 40$. $x = -5$ is an extraneous solution.

$$x^2 - 3x - 40 = 0$$

$$(x-8)(x+5) = 0$$

$$x = 8, -5$$

PTS: 2 REF: 012010aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

238 ANS: 3

$\sqrt{3x+18} = x$ -3 is extraneous.

$3x+18 = x^2$

$x^2 - 3x - 18 = 0$

$(x-6)(x+3) = 0$

$x = 6, -3$

PTS: 2 REF: 082315aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

239 ANS: 3

$\sqrt{x+1} = x+1$

$x+1 = x^2 + 2x + 1$

$0 = x^2 + x$

$0 = x(x+1)$

$x = -1, 0$

PTS: 2 REF: 011802aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

240 ANS: 2

$(x-1)^2 = 2x+6$ -1 is extraneous.

$x^2 - 2x + 1 = 2x + 6$

$x^2 - 4x - 5 = 0$

$(x-5)(x+1) = 0$

$x = 5, -1$

PTS: 2 REF: 082411aii NAT: A.REI.A.2 TOP: Solving Radicals

241 ANS: 2

$x+1 = \sqrt{4x+25}$ $-4+1 < 0$

$x^2 + 2x + 1 = 4x + 25$

$x^2 - 2x - 24 = 0$

$(x-6)(x+4) = 0$

$x = 6, -4$

PTS: 2 REF: 062408aii NAT: A.REI.A.2 TOP: Solving Radicals

242 ANS: 2

$$b^2 = 2b^2 - 64 \quad -8 \text{ is extraneous.}$$
$$-b^2 = -64$$
$$b = \pm 8$$

PTS: 2 REF: 061919aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

243 ANS: 3

$$x^2 - 4x - 5 = 4x^2 - 40x + 100$$
$$3x^2 - 36x + 105 = 0$$
$$x^2 - 12x + 35 = 0$$
$$(x-7)(x-5) = 0$$
$$x = 5, 7$$

PTS: 2 REF: 081807aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

244 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: 081704aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: advanced

245 ANS: 2

$$\sqrt{4-x} = x + 8 \qquad -12 + 8 = -4$$
$$4 - x = x^2 + 16x + 64$$
$$0 = x^2 + 17x + 60$$
$$x = (x+12)(x-5) + x = -12, 5$$

PTS: 2 REF: 012521aii NAT: A.REI.A.2 TOP: Solving Radicals

246 ANS:

$3x + 7 = x^2 - 2x + 1$ -1 is extraneous.

$0 = x^2 - 5x - 6$

$0 = (x - 6)(x + 1)$

$x = 6, -1$

PTS: 2 REF: 062326aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

247 ANS:

$\sqrt{4x + 1} = 11 - x$ 20 is extraneous.

$4x + 1 = 121 - 22x + x^2$

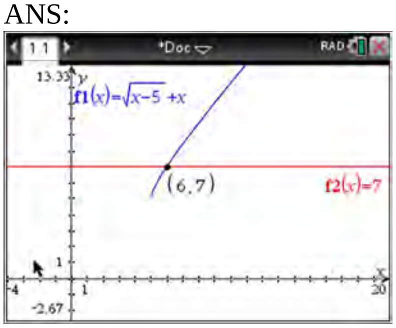
$0 = x^2 - 26x + 120$

$0 = (x - 6)(x - 20)$

$x = 6, 20$

PTS: 2 REF: 082227aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

248 ANS:



$\sqrt{x - 5} = -x + 7$ $\sqrt{x - 5} = -9 + 7 = -2$ is extraneous.

$x - 5 = x^2 - 14x + 49$

$0 = x^2 - 15x + 54$

$0 = (x - 6)(x - 9)$

$x = 6, 9$

PTS: 2 REF: spr1508aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

249 ANS:

$$\sqrt{x-4} = -x+6 \qquad \sqrt{x-4} = -8+6 = -2 \text{ is extraneous.}$$

$$x-4 = x^2-12x+36$$

$$0 = x^2-13x+40$$

$$0 = (x-8)(x-5)$$

$$x = 5,\ 8$$

PTS: 2 REF: 061730aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

250 ANS:

$$\sqrt{49-10x} = 2x-5 \qquad -\frac{3}{2} \text{ is extraneous.}$$

$$49-10x = 4x^2-20x+25$$

$$0 = 4x^2-10x-24$$

$$0 = 2x^2-5x-12$$

$$0 = (2x+3)(x-4)$$

$$x = -\frac{3}{2},4$$

PTS: 4 REF: 012333aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

251 ANS:

$$\sqrt{6-2x}+x = 2x+30-9 \qquad \sqrt{6-2(-29)} \neq -29+21, \text{ so } -29 \text{ is extraneous.}$$

$$\sqrt{6-2x} = x+21 \qquad \sqrt{64} \neq -8$$

$$6-2x = x^2+42x+441$$

$$x^2+44x+435 = 0$$

$$(x+29)(x+15) = 0$$

$$x = -29,-15$$

PTS: 4 REF: 061833aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

252 ANS:

$$2x-6=2\sqrt{x-1}$$ 2 is extraneous.

$$4x^2-24x+36=4(x-1)$$

$$x^2-6x+9=x-1$$

$$x^2-7x+10=0$$

$$(x-5)(x-2)=0$$

$$x=2,5$$

PTS: 4 REF: 012434aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

253 ANS:

$$3\sqrt{x}-2x=-5$$ 1 is extraneous.

$$3\sqrt{x}=2x-5$$

$$9x=4x^2-20x+25$$

$$4x^2-29x+25=0$$

$$(4x-25)(x-1)=0$$

$$x=\frac{25}{4},1$$

PTS: 4 REF: 011936aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

254 ANS:

$$\left(\sqrt{2x-7}\right)^2=(5-x)^2 \qquad \sqrt{2(4)-7}+4=5 \quad \sqrt{2(8)-7}+8=5$$

$$2x-7=25-10x+x^2 \qquad \sqrt{1}=1 \qquad \sqrt{9}\neq-3$$

$$0=x^2-12x+32$$

$$0=(x-8)(x-4)$$

$$x=4,8$$

PTS: 4 REF: 081635aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: extraneous solutions

255 ANS:

$$0 = \sqrt{t} - 2t + 6 \quad 2\left(\frac{9}{4}\right) - 6 < 0, \text{ so } \frac{9}{4} \text{ is extraneous.}$$

$$2t - 6 = \sqrt{t}$$

$$4t^2 - 24t + 36 = t$$

$$4t^2 - 25t + 36 = 0$$

$$(4t - 9)(t - 4) = 0$$

$$t = \frac{9}{4}, 4$$

$$(\sqrt{1} - 2(1) + 6) - (\sqrt{3} - 2(3) + 6) = 5 - \sqrt{3} \approx 3.268 \quad 327 \text{ mph}$$

PTS: 6 REF: 011737aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: context

256 ANS:

$$t = 2\pi\sqrt{\frac{67}{9.81}} \approx 16.4 \quad 9.6 = 2\pi\sqrt{\frac{L}{9.81}}$$

$$L \approx 22.9$$

PTS: 4 REF: 062234aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: context

257 ANS:

$B = 1.69\sqrt{30+4.45} - 3.49 \approx 6$, which is a steady breeze.

$$\begin{aligned} 15 &= 1.69\sqrt{s+4.45} - 3.49 \\ 18.49 &= 1.69\sqrt{s+4.45} \\ \frac{18.49}{1.69} &= \sqrt{s+4.45} \\ \left(\frac{18.49}{1.69}\right)^2 &= s+4.45 \\ s &= \left(\frac{18.49}{1.69}\right)^2 - 4.45 \\ s &\approx 115 \end{aligned}$$

$$\begin{aligned} 9.5 &= 1.69\sqrt{s+4.45} - 3.49 \\ 12.99 &= 1.69\sqrt{s+4.45} \\ \frac{12.99}{1.69} &= \sqrt{s+4.45} \\ \left(\frac{12.99}{1.69}\right)^2 &= s+4.45 \\ s &= \left(\frac{12.99}{1.69}\right)^2 - 4.45 \\ s &\approx 55 \end{aligned}$$

$$\begin{aligned} 10.49 &= 1.69\sqrt{s+4.45} - 3.49 \\ 13.98 &= 1.69\sqrt{s+4.45} \\ \frac{13.98}{1.69} &= \sqrt{s+4.45} \\ \left(\frac{13.98}{1.69}\right)^2 &= s+4.45 \\ s &= \left(\frac{13.98}{1.69}\right)^2 - 4.45 \\ s &\approx 64 \end{aligned}$$

55-64

PTS: 6 REF: 081937aii NAT: A.REI.A.2 TOP: Solving Radicals
KEY: context

258 ANS: 1

$1 + \frac{0.027}{12} = 1.00225$

PTS: 2 REF: 082403aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

259 ANS: 2

$1.00643^{12} \approx 1.08$

PTS: 2 REF: 081808aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

260 ANS: 2

$B(t) = 750\left(1.16^{\frac{1}{12}}\right)^{12t} \approx 750(1.012)^{12t}$ $B(t) = 750\left(1 + \frac{0.16}{12}\right)^{12t}$ is wrong, because the growth is an annual rate that is not compounded monthly.

PTS: 2 REF: spr1504aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

261 ANS: 1

$50(1.19^{\frac{1}{12}})^{12t} \approx 50(1.015)^{12t}$

PTS: 2 REF: 012424aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

262 ANS: 1

$1.025^{\frac{1}{12}} \approx 1.00206$

PTS: 2 REF: 081924aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

263 ANS: 1

$\left(1.03^{\frac{1}{12}}\right)^{12t} \approx 1.00247^{12t}$

PTS: 2 REF: 062224aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

264 ANS: 3

$1.04^{\frac{1}{12}} \approx 1.0032737$

PTS: 2 REF: 011906aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

265 ANS: 1

$1.0325^{\frac{1}{12}} \approx 1.0027$

PTS: 2 REF: 012323aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

266 ANS: 3

$1.0525^{\frac{1}{12}} \approx 1.00427$

PTS: 2 REF: 061621aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

267 ANS: 4

$1.06^{\frac{1}{52}}$

PTS: 2 REF: 061924aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

268 ANS: 3

$0.75^{\frac{1}{10}} \approx .9716$

PTS: 2 REF: 061713aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

269 ANS: 2

$.962^{10} \approx .679$

PTS: 2 REF: 082311aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

270 ANS: 4
1 year = 365 days

PTS: 2 REF: 061823aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

271 ANS: 4

$A(t)=150\left((1.02)^{\frac{1}{7}}\right)^{7t}\approx 150(1.00283)^{7t}$

PTS: 2 REF: 062415aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

272 ANS: 1

$0.5^{\frac{1}{0.0803}}\approx 0.000178$

PTS: 2 REF: 082224aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

273 ANS: 3

$\left(\frac{1}{2}\right)^{\frac{1}{73.83}}\approx 0.990656$

PTS: 2 REF: 081710aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

274 ANS: 3

$e^{\left(-\frac{3}{0.6}\right)}\approx 0.006738$

PTS: 2 REF: 062315aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

275 ANS: 4

$1+\frac{.009}{12}=1.00075$

PTS: 2 REF: 011918aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

276 ANS: 4 PTS: 2 REF: 011808aii NAT: A.SSE.B.3
TOP: Modeling Exponential Functions

277 ANS:

Julia: $V(x)=33{,}400(0.85^{\frac{1}{12}})^{12x}\approx 33{,}400(0.9865)^{12x}$

PTS: 2 REF: 012530aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

278 ANS: 1 PTS: 2 REF: 082309aii NAT: F.BF.A.1
TOP: Modeling Exponential Functions

279 ANS: 4 PTS: 2 REF: 062411aii NAT: F.BF.A.1
TOP: Modeling Exponential Functions

280 ANS: 1

$2000\left(1+\frac{.032}{12}\right)^{12t}\approx 2000(1.003)^{12t}$

PTS: 2 REF: 012004aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

281 ANS: 4 PTS: 2 REF: 081622aii NAT: F.BF.A.1
TOP: Modeling Exponential Functions

282 ANS: 1

$$\frac{A}{P} = e^{rt}$$

$$0.42 = e^{rt}$$

$$\ln 0.42 = \ln e^{rt}$$

$$-0.87 \approx rt$$

PTS: 2 REF: 011723aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

283 ANS: 3

$a = 105, 0 < b < 1$

PTS: 2 REF: 082314aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

284 ANS:

$$B(t) = 100(2)^{\frac{t}{30}}$$

PTS: 2 REF: 012031aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

285 ANS:

$$C(t) = 130(0.5)^{\frac{t}{5.5}}$$

PTS: 2 REF: 082430aii NAT: F.BF.A.1 TOP: Modeling Exponential Functions

286 ANS: 1

$$P(28) = 5(2)^{\frac{98}{28}} \approx 56$$

PTS: 2 REF: 011702aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

287 ANS: 4

$$5000\left(1 + \frac{.035}{12}\right)^{12 \cdot 6} \approx 6166.50$$

PTS: 2 REF: 081917aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

288 ANS: 3

$$y = 278(0.5)^{\frac{18}{1.8}} \approx 0.271$$

PTS: 2 REF: 011920aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

289 ANS:

$N(t) = 950e^{0.0475t}$ The base is e because growth is continuous. $N\left(\frac{36}{24}\right) \approx 1020$

PTS: 4 REF: 081933aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

290 ANS:

$A(t) = 100(0.5)^{\frac{t}{63}}$, where t is time in years, and $A(t)$ is the amount of titanium-44 left after t years.

$\dfrac{A(10) - A(0)}{10 - 0} = \dfrac{89.58132 - 100}{10} = -1.041868$ The estimated mass at $t = 40$ is $100 - 40(-1.041868) \approx 58.3$. The actual mass is $A(40) = 100(0.5)^{\frac{40}{63}} \approx 64.3976$. The estimated mass is less than the actual mass.

PTS: 6 REF: fall1517aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions

291 ANS: 1

Estimate (0,50) and (1,38) as points on the graph. $\dfrac{38}{50} = 76\%$ implies an estimated 24% rate of decay. Confirmed with graph of $y = 50(.77)^x$:

PTS: 2 REF: 012516aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

292 ANS: 4 PTS: 2 REF: 012303aii NAT: F.LE.B.5
TOP: Modeling Exponential Functions

293 ANS: 4 PTS: 2 REF: 011805aii NAT: F.LE.B.5
TOP: Modeling Exponential Functions

294 ANS: 1

1) $A(20) > 0$; 2) $.5 \times .5 = .25$; 3) true; 4) $A(7) \approx 9.9$

PTS: 2 REF: 082211aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

295 ANS: 1

The car lost approximately 19% of its value each year.

PTS: 2 REF: 081613aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

296 ANS: 2

The mass of the carbon-14 is decreasing by half every 5715 years.

PTS: 2 REF: 062211aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

297 ANS: 2

The 2010 population is 110 million.

PTS: 2 REF: 061718aii NAT: F.LE.B.5 TOP: Modeling Exponential Functions

298 ANS: 2 PTS: 2 REF: 061917aii NAT: F.LE.B.5
TOP: Modeling Exponential Functions

299 ANS: 2

$i = \dfrac{6.24\%}{12} = .52\%$ $R = \dfrac{(18000)(.52\%)}{1 - (1 + .52\%)^{-12 \cdot 6}} \approx 300.36$

PTS: 2 REF: 012420aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

300 ANS: 4

$$M=\frac{45000\left(\frac{6.75\%}{12}\right)\left(1+\frac{6.75\%}{12}\right)^{5\times 12}}{\left(1+\frac{6.75\%}{12}\right)^{5\times 12}-1}\approx 885.76$$

PTS: 2 REF: 082316aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

301 ANS: 3

$$M=\frac{240000\left(\frac{4.5\%}{12}\right)\left(1+\frac{4.5\%}{12}\right)^{15\times 12}}{\left(1+\frac{4.5\%}{12}\right)^{15\times 12}-1}\approx 1835.98$$

PTS: 2 REF: 062209aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

302 ANS:

$$M=\frac{(152500-15250)\left(\frac{.036}{12}\right)\left(1+\frac{.036}{12}\right)^{360}}{\left(1+\frac{.036}{12}\right)^{360}-1}\approx 624$$

PTS: 2 REF: 061831aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

303 ANS:

$$20000=PMT\left(\frac{1-(1+.00625)^{-60}}{0.00625}\right) \quad 21000-x=300\left(\frac{1-(1+.00625)^{-60}}{0.00625}\right)$$

$$PMT\approx 400.76 \qquad x\approx 6028$$

PTS: 4 REF: 011736aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

304 ANS:

$$M=172600\bullet\frac{0.00305(1+0.00305)^{12\cdot 15}}{(1+0.00305)^{12\cdot 15}-1}\approx 1247 \qquad 1100=(172600-x)\bullet\frac{0.00305(1+0.00305)^{12\cdot 15}}{(1+0.00305)^{12\cdot 15}-1}$$

$$1100\approx(172600-x)\bullet(0.007228)$$

$$152193\approx 172600-x$$

$$20407\approx x$$

PTS: 4 REF: 061734aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

305 ANS: 4

$$F=325-185e^{-0.4(0)}=325-185=140$$

PTS: 2 REF: 012415aii NAT: F.IF.B.4 TOP: Evaluating Exponential Expressions

306 ANS: 3

$$d = 10\log\frac{6.3\times 10^{-3}}{1.0\times 10^{-12}} \approx 98$$

PTS: 2 REF: 011715aii NAT: F.IF.B.4 TOP: Evaluating Logarithmic Expressions

307 ANS: 4

$$y = 5^{-t} = \left(\frac{1}{5}\right)^t$$

PTS: 2 REF: 061615aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

308 ANS: 2

$$p(x) = 4^x,\ q(x) = \left(\frac{5}{9}\right)^x,\ r(x) = 5.29^x,\ s(x) = 2^x$$

PTS: 2 REF: 012304aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

309 ANS:

$e^{0.0532} > 1$, so $P(t)$ is increasing.

PTS: 2 REF: 062327aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

310 ANS:

$0 < e^{\frac{\left(\ln\frac{1}{2}\right)}{1590}} < 1$, so $M(t)$ represents decay.

PTS: 2 REF: 011728aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

311 ANS: 4

There is no x-intercept.

PTS: 2 REF: 011823aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

312 ANS: 2 PTS: 2 REF: 061802aii NAT: F.IF.C.7

TOP: Graphing Exponential Functions

313 ANS: 2

$$\begin{aligned} 2^x - 4 &> 0 \\ 2^x &> 4 \\ x &> 2 \end{aligned}$$

PTS: 2 REF: 082402aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

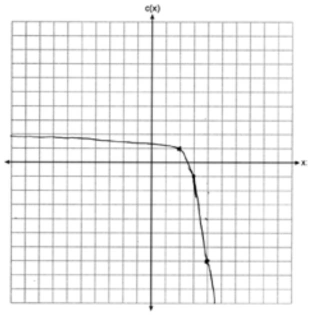
314 ANS: 3 PTS: 2 REF: 082214aii NAT: F.IF.C.7

TOP: Graphing Exponential Functions

315 ANS:
Translation 3 units right and 4 units up

PTS: 2 REF: 012027aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

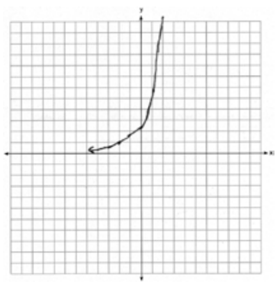
316 ANS:



As $x \to \infty, c(x) \to -\infty$. As $x \to -\infty, c(x) \to 2$.

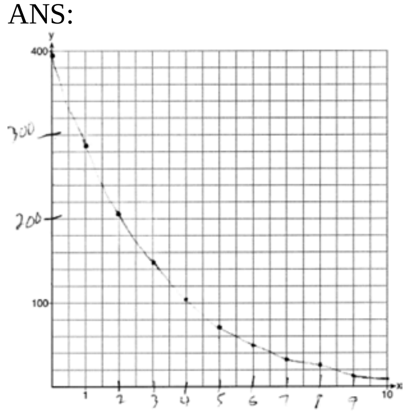
PTS: 4 REF: 012335aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

317 ANS:



PTS: 2 REF: 082425aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

318 ANS:



PTS: 2 REF: 061729aii NAT: F.IF.C.7 TOP: Graphing Exponential Functions

319 ANS: 2 PTS: 2 REF: 081816aii NAT: F.BF.B.5
TOP: Inverse of Functions KEY: bimodalgraph | exponential

320 ANS: 3 PTS: 2 REF: 011917aii NAT: F.BF.B.5
TOP: Inverse of Functions KEY: exponential

321 ANS: 3 PTS: 2 REF: 011708aii NAT: F.BF.B.5
TOP: Inverse of Functions KEY: exponential

322 ANS:

No, because $f(-x) = 2^{-x}$ $\quad g(x) = f(x) + 5$

$$2^{-x} \neq 2^{x}$$

$$y = 2^x + 5$$

$$x = 2^y + 5$$

$$\log(x-5) = \log 2^y$$

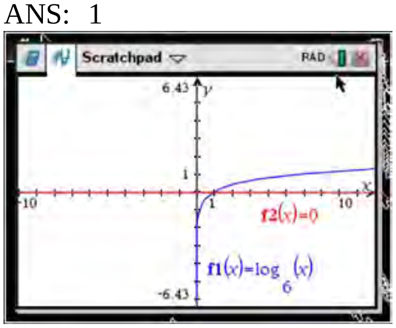
$$\frac{\log(x-5)}{\log 2} = \frac{y \log 2}{\log 2}$$

$$\frac{\log(x-5)}{\log 2} = h(x)$$

PTS: 4 REF: 082435aii NAT: F.BF.B.5 TOP: Inverse of Functions
KEY: exponential

323 ANS: 2 PTS: 2 REF: 082409aii NAT: F.IF.C.7
TOP: Graphing Logarithmic Functions

324 ANS: 1



PTS: 2 REF: 061618aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

325 ANS: 4 PTS: 2 REF: 062215aii NAT: F.IF.C.7
TOP: Graphing Logarithmic Functions

326 ANS: 1 PTS: 2 REF: 011902aii NAT: F.IF.C.7
TOP: Graphing Logarithmic Functions

327 ANS: 4

$$\log_2(x-1) - 1 = 0$$

$$\log_2(x-1) = 1$$

$$x - 1 = 2^1$$

$$x = 3$$

PTS: 2 REF: 061819aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

328 ANS: 1 PTS: 2 REF: 062308aii NAT: F.IF.C.7
TOP: Graphing Logarithmic Functions

329 ANS: 4

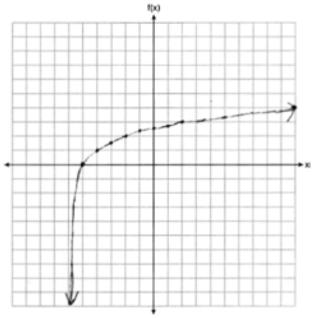
Translate the parent log function 2 to the right and reflect over the x-axis.

PTS: 2 REF: 082207aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

330 ANS:
left 3, down 5

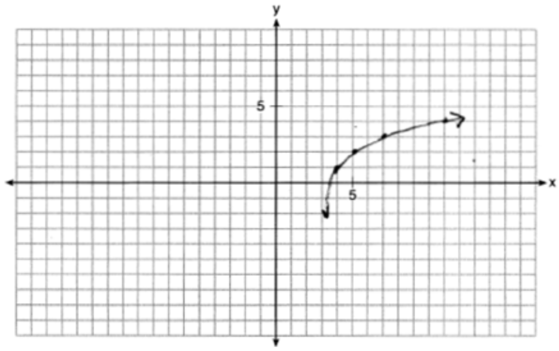
PTS: 2 REF: 012525aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

331 ANS:



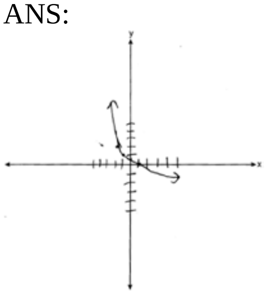
PTS: 2 REF: 061927aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

332 ANS:



PTS: 2 REF: 011932aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

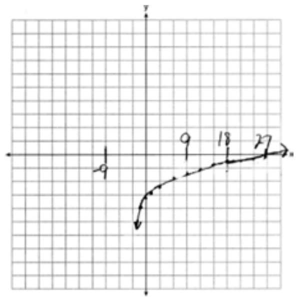
333 ANS:



As $x \to -3, y \to \infty$. As $x \to \infty, y \to -\infty$..

PTS: 4 REF: 082333aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

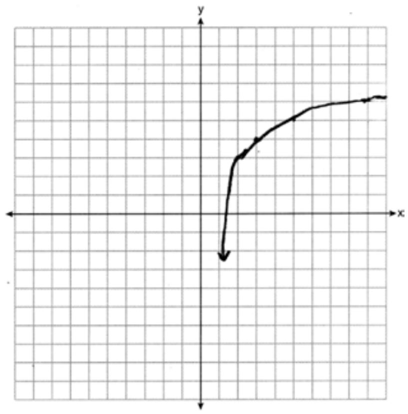
334 ANS:



As $x \to -3, y \to -\infty$. As $x \to \infty, y \to \infty$.

PTS: 4 REF: 061735aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

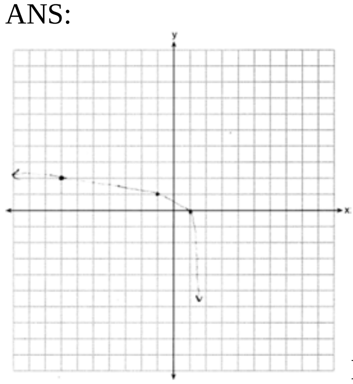
335 ANS:



$x = 1, y = 1$

PTS: 4 REF: 062436aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

336 ANS:



Domain: $x < 2$, Asymptote $x = 2$

PTS: 4 REF: 012034aii NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

337 ANS: 3 PTS: 2 REF: 012404aii NAT: F.LE.A.4
TOP: Express Exponentials as Logarithms

338 ANS: 1

$$\log 3^{x+4} = \log 28$$

$$\frac{(x+4)\log 3}{\log 3} = \frac{\log 28}{\log 3}$$

$$x+4 = \frac{\log 28}{\log 3}$$

$$x = \log_3 28 - 4$$

PTS: 2 REF: 082306aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

339 ANS: 3

$$10^{5x-2} = 3$$

$$\log 10^{5x-2} = \log 3$$

$$(5x-2)\log 10 = \log 3$$

$$5x-2 = \log 3$$

$$5x = \log 3 + 2$$

$$x = \frac{\log 3 + 2}{5}$$

PTS: 2 REF: 012517aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

340 ANS: 3

$$e^{bt} = \frac{c}{a}$$

$$\ln e^{bt} = \ln \frac{c}{a}$$

$$bt \ln e = \ln \frac{c}{a}$$

$$t = \frac{\ln \frac{c}{a}}{b}$$

PTS: 2 REF: 011813aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

341 ANS: 4

$$6\left(2^{x+4}\right)=36$$
$$\ln 2^{x+4}=\ln 6$$
$$(x+4)\ln 2=\ln 6$$
$$x+4=\frac{\ln 6}{\ln 2}$$
$$x=\frac{\ln 6}{\ln 2}-4$$

PTS: 2 REF: 082408aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

342 ANS: 1

$$8(2^{x+3})=48$$
$$2^{x+3}=6$$
$$(x+3)\ln 2=\ln 6$$
$$x+3=\frac{\ln 6}{\ln 2}$$
$$x=\frac{\ln 6}{\ln 2}-3$$

PTS: 2 REF: 061702aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

343 ANS: 1

$$\ln e^{x+2}=\ln\frac{7}{5}$$
$$(x+2)\ln e=\ln\frac{7}{5}$$
$$x=-2+\ln\frac{7}{5}$$

PTS: 2 REF: 062207aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

344 ANS: 4

$$\ln e^{0.3x}=\ln\frac{5918}{87}$$
$$x=\frac{\ln\frac{5918}{87}}{0.3}$$

PTS: 2 REF: 081801aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

345 ANS: 2

$$4300e^{0.07x} = 5123$$

$$\ln e^{0.07x} = \ln\frac{5123}{4300}$$

$$0.07x = \ln\frac{5123}{4300}$$

$$x = \frac{\ln\frac{5123}{4300}}{0.07}$$

$$x \approx 2.5$$

PTS: 2 REF: 012302aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

346 ANS: 4

$$\log 2^t = \log\sqrt{10} \quad 2)\ \frac{\log\sqrt{10}}{\log 2} = \log_2\sqrt{10},\ \ 1)\ \log_2\sqrt{10} = \log_2 10^{\frac{1}{2}} = \frac{1}{2}\log_2 10,\ 3)\ \log_4 10 = \frac{\log_2 10}{\log_2 4} = \frac{1}{2}\log_2 10$$

$$t\log 2 = \log\sqrt{10}$$

$$t = \frac{\log\sqrt{10}}{\log 2}$$

PTS: 2 REF: 012009aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

347 ANS:

$$a^{x+1} = a^{\frac{2}{3}}$$

$$x + 1 = \frac{2}{3}$$

$$x = -\frac{1}{3}$$

PTS: 2 REF: 012326aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: common base shown

348 ANS:

$$\ln e^{0.49x} = \ln 7.5$$

$$0.49x = \ln 7.5$$

$$x = \frac{\ln 7.5}{0.49} \approx 4.112$$

PTS: 2 REF: 062330aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

349 ANS:

$$\ln e^{1.5t} = \ln \frac{16}{3.8}$$

$$1.5t = \ln \frac{16}{3.8}$$

$$t = \frac{\ln \frac{16}{3.8}}{1.5} \approx .96$$

PTS: 2 REF: 062426aii NAT: F.LE.A.4 TOP: Exponential Equations
KEY: without common base

350 ANS: 4

$$\frac{15000}{12000} = \frac{12000e^{.025t}}{12000}$$

$$1.25 = e^{.025t}$$

$$\ln 1.25 = \ln e^{.025t}$$

$$\ln 1.25 = .025t$$

$$\frac{\ln 1.25}{.025} = t$$

PTS: 2 REF: 082209aii NAT: F.LE.A.4 TOP: Exponential Growth

351 ANS: 1

$$9110 = 5000e^{30r}$$

$$\ln \frac{911}{500} = \ln e^{30r}$$

$$\frac{\ln \frac{911}{500}}{30} = r$$

$$r \approx .02$$

PTS: 2 REF: 011810aii NAT: F.LE.A.4 TOP: Exponential Growth

352 ANS:

4% $8.75 = 1.25(1+r)^{49}$ or $8.75 = 1.25e^{49r}$

$$7 = (1+r)^{49} \qquad \ln 7 = \ln e^{49r}$$

$$r + 1 = \sqrt[49]{7} \qquad \ln 7 = 49r$$

$$r \approx .04 \qquad r = \frac{\ln 7}{49}$$

$$r \approx .04$$

PTS: 2 REF: 081730aii NAT: F.LE.A.4 TOP: Exponential Growth

353 ANS:

$$A = Pe^{rt}$$

$$135000 = 100000e^{5r}$$

$$1.35 = e^{5r}$$

$$\ln 1.35 = \ln e^{5r}$$

$$\ln 1.35 = 5r$$

$$.06 \approx r \text{ or } 6\%$$

PTS: 2 REF: 061632aii NAT: F.LE.A.4 TOP: Exponential Growth

354 ANS:

$$2 = e^{0.0375t}$$

$$t \approx 18.5$$

PTS: 4 REF: 081835aii NAT: F.LE.A.4 TOP: Exponential Growth

355 ANS:

a) $p(t) = 11000(2)^{\frac{t}{20}}$; b) $\frac{1000000}{11000} = \frac{11000(2)^{\frac{t}{20}}}{11000}$

$$\log \frac{1000}{11} = \log 2^{\frac{t}{20}}$$

$$\log \frac{1000}{11} = \frac{t \cdot \log 2}{20}$$

$$\frac{20 \log \frac{1000}{11}}{\log 2} = t$$

$$t \approx 130.13$$

PTS: 4 REF: 082233aii NAT: F.LE.A.4 TOP: Exponential Growth

356 ANS:

$C(t) = 63000\left(1 + \frac{0.0255}{12}\right)^{12t}$ $63000\left(1 + \frac{0.0255}{12}\right)^{12t} = 100000$

$$12t \log(1.002125) = \log \frac{100}{63}$$

$$t \approx 18.14$$

PTS: 4 REF: 061835aii NAT: F.LE.A.4 TOP: Exponential Growth

357 ANS:

$A = 5000(1.045)^n$ $\quad 5000\left(1+\frac{.046}{4}\right)^{4(6)} - 5000(1.045)^6 \approx 6578.87 - 6511.30 \approx 67.57$ $\quad 10000 = 5000\left(1+\frac{.046}{4}\right)^{4n}$

$B = 5000\left(1+\frac{.046}{4}\right)^{4n}$

$$2 = 1.0115^{4n}$$

$$\log 2 = 4n \cdot \log 1.0115$$

$$n = \frac{\log 2}{4\log 1.0115}$$

$$n \approx 15.2$$

PTS: 6 REF: 081637aii NAT: F.LE.A.4 TOP: Exponential Growth

358 ANS:

$A(t) = 8000\left(1+\frac{.042}{4}\right)^{4t}$ $\quad A(18) = 16970.900$ $\quad 24000 = 8000e^{.039t}$

$B(t) = 8000e^{.039t}$ $\quad \underline{B(18) = 16142.274}$ $\quad \ln 3 = \ln e^{.039t}$

828.63 $\quad \ln 3 = .039t$

$$t \approx 28.2$$

PTS: 6 REF: 082337aii NAT: F.LE.A.4 TOP: Exponential Growth

359 ANS:

$A(t) = 1200\left(1+\frac{6.4\%}{4}\right)^{4t}$ Barnyard because $A(10) \approx 2264.28$ $\quad 3 = e^{6.35\% t}$

$B(t) = 1200e^{6.35\% t}$ $\quad B(18) = 2264.43$ $\quad \ln 3 = \ln e^{6.35\% t}$

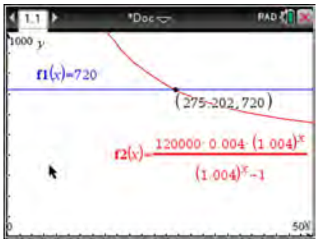
$$\ln 3 = 0.635t$$

$$\frac{\ln 3}{0.635} = \frac{0.635t}{0.635}$$

$$t \approx 17.3$$

PTS: 6 REF: 082437aii NAT: F.LE.A.4 TOP: Exponential Growth

360 ANS:



$$720 = \frac{120000\left(\frac{.048}{12}\right)\left(1+\frac{.048}{12}\right)^n}{\left(1+\frac{.048}{12}\right)^n - 1} \qquad \frac{275.2}{12} \approx 23 \text{ years}$$

$$720(1.004)^n - 720 = 480(1.004)^n$$

$$240(1.004)^n = 720$$

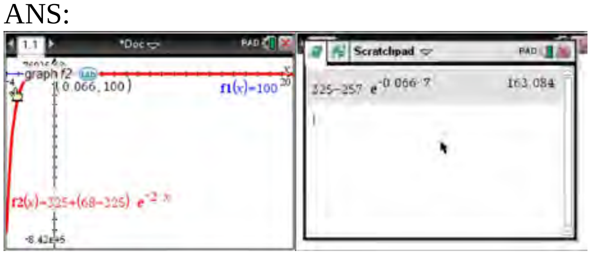
$$1.004^n = 3$$

$$n \log 1.004 = \log 3$$

$$n \approx 275.2 \text{ months}$$

PTS: 4 REF: spr1509aii NAT: F.LE.A.4 TOP: Exponential Growth

361 ANS:



$$100 = 325 + (68 - 325)e^{-2k} \qquad T = 325 - 257e^{-0.066t}$$

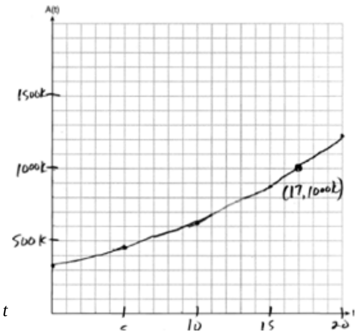
$$-225 = -257e^{-2k} \qquad T = 325 - 257e^{-0.066(7)} \approx 163$$

$$k = \frac{\ln\left(\frac{-225}{-257}\right)}{-2}$$

$$k \approx 0.066$$

PTS: 4 REF: fall1513aii NAT: F.LE.A.4 TOP: Exponential Growth

362 ANS:



$A(t) = 318000(1.07)^t$

$$318000(1.07)^t = 1000000$$
$$1.07^t = \frac{1000}{318}$$
$$t\log 1.07 = \log\frac{1000}{318}$$
$$t = \frac{\log\frac{1000}{318}}{\log 1.07}$$
$$t \approx 17$$

The graph of $A(t)$ nearly intersects the point $(17,1000000)$.

PTS: 6 REF: 011937aii NAT: F.LE.A.4 TOP: Exponential Growth

363 ANS: 1

$$50(.9)^t = 25$$
$$t \approx 6.57$$

PTS: 2 REF: 082317aii NAT: F.LE.A.4 TOP: Exponential Decay

364 ANS: 1

$$100\left(\frac{1}{2}\right)^{\frac{d}{8}} = 100e^{kd}$$
$$\left(\frac{1}{2}\right)^{\frac{1}{8}} = e^k$$
$$k \approx -0.087$$

PTS: 2 REF: 061818aii NAT: F.LE.A.4 TOP: Exponential Decay

365 ANS: 4

$$120 = 68 + (195 - 68)e^{-0.05t}$$
$$52 = 127e^{-0.05t}$$
$$\ln\frac{52}{127} = \ln e^{-0.05t}$$
$$\ln\frac{52}{127} = -0.05t$$
$$\frac{\ln\frac{52}{127}}{-0.05} = t$$
$$18 \approx t$$

PTS: 2 REF: 081918aii NAT: F.LE.A.4 TOP: Exponential Decay

366 ANS:

$$7 = 20(0.5)^{\frac{t}{8.02}}$$
$$\log 0.35 = \log 0.5^{\frac{t}{8.02}}$$
$$\log 0.35 = \frac{t\log 0.5}{8.02}$$
$$\frac{8.02\log 0.35}{\log 0.5} = t$$
$$t \approx 12$$

PTS: 4 REF: 081634aii NAT: F.LE.A.4 TOP: Exponential Decay

367 ANS:

$$s(t) = 200(0.5)^{\frac{t}{15}} \qquad \frac{1}{10} = (0.5)^{\frac{t}{15}}$$
$$\log\frac{1}{10} = \log(0.5)^{\frac{t}{15}}$$
$$-1 = \frac{t \cdot \log(0.5)}{15}$$
$$t = \frac{-15}{\log(0.5)} \approx 50$$

PTS: 4 REF: 061934aii NAT: F.LE.A.4 TOP: Exponential Decay

368 ANS:

$$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}} \quad \log\frac{100}{140} = \log\left(\frac{1}{2}\right)^{\frac{5}{h}} \qquad 40 = 140\left(\frac{1}{2}\right)^{\frac{t}{10.3002}}$$

$$\log\frac{5}{7} = \frac{5}{h}\log\frac{1}{2} \qquad \log\frac{2}{7} = \log\left(\frac{1}{2}\right)^{\frac{t}{10.3002}}$$

$$h = \frac{5\log\frac{1}{2}}{\log\frac{5}{7}} \approx 10.3002 \qquad \log\frac{2}{7} = \frac{t\log\left(\frac{1}{2}\right)}{10.3002}$$

$$t = \frac{10.3002\log\frac{2}{7}}{\log\frac{1}{2}} \approx 18.6$$

PTS: 6 REF: 061737aii NAT: F.LE.A.4 TOP: Exponential Decay

369 ANS:

$$112 = 73 + (237-73)e^{-1.5k} \quad T(2.5) = 73 + (237-73)e^{(-.958)(2.5)} \approx 88 \quad 80 = 73 + (237-73)e^{-.958t}$$

$$k \approx .958 \qquad t \approx 3.3$$

PTS: 6 REF: 062437aii NAT: F.LE.A.4 TOP: Exponential Decay

370 ANS: 1

$$x^2 + 2x - 8 = 0$$

$$(x+4)(x-2) = 0$$

$$x = -4, 2$$

PTS: 2 REF: 081701aii NAT: A.APR.D.6 TOP: Undefined Rationals

371 ANS: 4

$$\frac{x^2-4x}{2x} = \frac{x(x-4)}{2x} = \frac{x-4}{2} = \frac{x}{2} - 2 \quad \frac{x-1}{2} - \frac{3}{2} = \frac{x-1-3}{2} = \frac{x-4}{2}$$

PTS: 2 REF: 011921aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

372 ANS: 1

$$\frac{x(x^2-9)}{-(x^2-9)} = -x$$

PTS: 2 REF: 012023aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

373 ANS: 2

$$\frac{x^2+3x}{x^2+5x+6}=\frac{x(x+3)}{(x+2)(x+3)}$$

PTS: 2 REF: 082215aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

374 ANS: 4

$$\frac{-3x^2-5x+2}{x^3+2x^2}=\frac{(-3x+1)(x+2)}{x^2(x+2)}=\frac{-3x}{x^2}+\frac{1}{x^2}=-3x^{-1}+x^{-2}$$

PTS: 2 REF: 061723aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

375 ANS: 3

$$\frac{x^2(x+2)-9(x+2)}{x\left(x^2-x-6\right)}=\frac{\left(x^2-9\right)(x+2)}{x(x-3)(x+2)}=\frac{(x+3)(x-3)}{x(x-3)}=\frac{x+3}{x}$$

PTS: 2 REF: 061803aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

376 ANS: 1

1) $(x+3)^2-16=x^2+6x+9-16=x^2+6x-7=(x+7)(x-1)$; 2) $u=x+3$; 3)

$$u^2-10u-2u+20$$
$$u(u-10)-2(u-10)$$
$$(u-2)(u-10)$$
$$(x+3-2)(x+3-10)$$
$$(x+1)(x-7)$$

$\dfrac{(x-1)(x-7)(x+1)}{(x+1)}=(x-1)(x-7)$; 4) $\dfrac{(x+7)(x+1)(x+3)}{(x+3)}=(x+7)(x+1)$

PTS: 2 REF: 061808aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

377 ANS:

$$\frac{x^2(2x+1)-9(2x+1)}{x(3-x)}=\frac{(x^2-9)(2x+1)}{x(3-x)}=\frac{(x+3)(x-3)(2x+1)}{x(3-x)}=\frac{(x+3)(2x+1)}{-x}$$

PTS: 2 REF: 062331ai NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

378 ANS: 3

$$\frac{c^2-d^2}{d^2+cd-2c^2}=\frac{(c+d)(c-d)}{(d+2c)(d-c)}=\frac{-(c+d)}{d+2c}=\frac{-c-d}{d+2c}$$

PTS: 2 REF: 011818aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: factoring

379 ANS: 3

$$\begin{array}{r|l} & \quad 2x+1 \\ x+2 & 2x^2+5x+8 \\ & \underline{2x^2+4x} \\ & \qquad\quad x+8 \\ & \qquad\quad \underline{x+2} \\ & \qquad\qquad 6 \end{array}$$

PTS: 2 REF: 012007aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

380 ANS: 1

$$\begin{array}{r|l} & \quad 2x^2+3x+4 \\ x-3 & 2x^3-3x^2-5x-12 \\ & \underline{2x^3-6x^2} \\ & \qquad 3x^2-5x \\ & \qquad \underline{3x^2-9x} \\ & \qquad\qquad 4x-12 \\ & \qquad\qquad \underline{4x-12} \\ & \qquad\qquad\quad 0 \end{array}$$

PTS: 2 REF: 012505aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

381 ANS: 2

$$\begin{array}{r|l} & x^2+0x+1 \\ \hline x+2 & x^3+2x^2+x+6 \\ & \underline{x^3+2x^2} \\ & \quad 0x^2+x \\ & \quad \underline{0x^2+0x} \\ & \qquad x+6 \\ & \qquad \underline{x+2} \\ & \qquad\quad 4 \end{array}$$

PTS: 2 REF: 081611aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

382 ANS: 2

$$\begin{array}{r|l} & 2x^2-3x+5 \\ \hline x+3 & 2x^3+3x^2-4x+5 \\ & \underline{2x^3+6x^2} \\ & \quad -3x^2-4x \\ & \quad \underline{-3x^2-9x} \\ & \qquad 5x+5 \\ & \qquad \underline{5x+15} \\ & \qquad\quad -10 \end{array}$$

PTS: 2 REF: 082302aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

383 ANS: 1

$$
\begin{array}{r}
2x^2 + x - 6 \\
x+3 \overline{\smash{\big)}\, 2x^3 + 7x^2 - 3x - 25} \\
\underline{2x^3 + 6x^2} \qquad\qquad \\
x^2 - 3x \qquad\; \\
\underline{x^2 + 3x} \qquad\; \\
-6x - 25 \\
\underline{-6x - 18} \\
-7
\end{array}
$$

PTS: 2 REF: 062203aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

384 ANS: 3

$$
\begin{array}{r}
2x^3 - 4x^2 - x + \dfrac{14}{x+6} \\
x+6 \overline{\smash{\big)}\, 2x^4 + 8x^3 - 25x^2 - 6x + 14} \\
\underline{2x^4 + 12x^3} \qquad\qquad\qquad\quad \\
-4x^3 - 25x^2 \qquad\qquad \\
\underline{-4x^3 - 24x^2} \qquad\qquad \\
-x^2 - 6x \qquad \\
\underline{-x^2 - 6x} \qquad
\end{array}
$$

PTS: 2 REF: 081805aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

385 ANS: 2

$$
\begin{array}{r|l}
 & x^2 + 2x + 4 \\
\hline
x - 2 & x^3 - 0x^2 + 0x - 2 \\
 & \underline{x^3 - 2x^2} \\
 & \quad 2x^2 + 0x \\
 & \quad \underline{2x^2 - 4x} \\
 & \qquad 4x - 2 \\
 & \qquad \underline{4x - 8} \\
 & \qquad\quad 6
\end{array}
$$

PTS: 2 REF: 082217aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

386 ANS: 1

$$
\begin{array}{r|l}
 & x^3 - 2x^2 - x + 6 \\
\hline
x + 2 & x^4 + 0x^3 - 5x^2 + 4x + 14 \\
 & \underline{x^4 + 2x^3} \\
 & \quad -2x^3 - 5x^2 \\
 & \quad \underline{-2x^3 - 4x^2} \\
 & \qquad -x^2 + 4x \\
 & \qquad \underline{-x^2 - 2x} \\
 & \qquad\quad 6x + 14 \\
 & \qquad\quad \underline{6x + 12} \\
 & \qquad\qquad 2
\end{array}
$$

PTS: 2 REF: 012305aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

387 ANS: 2

$$\begin{array}{r|l} & 2x^3+6x^2+13x+42 \\ \hline x-3 & 2x^4+0x^3-5x^2+3x-2 \end{array}$$

$$\underline{2x^4-6x^3}$$

$$6x^3-5x^2$$

$$\underline{6x^3-18x^2}$$

$$13x^2+3x$$

$$\underline{13x^2-39x}$$

$$42x-2$$

$$\underline{42x-126}$$

$$124$$

PTS: 2 REF: 012408aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

388 ANS: 4

$$\begin{array}{r|l} & 6x^3-8x^2+16x-31 \\ \hline x+2 & 6x^4+4x^3+0x^2+x+200 \end{array}$$

$$\underline{6x^4+12x^3}$$

$$-8x^3+0x^2$$

$$\underline{-8x^3-16x^2}$$

$$16x^2+x$$

$$\underline{16x^2+32x}$$

$$-31x+200$$

$$\underline{-31x-62}$$

$$262$$

PTS: 2 REF: 082407aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

389 ANS: 4

$$\begin{array}{r} 5x^2+x-3 \\ 2x-1\overline{\big)\,10x^3-3x^2-7x+3} \end{array}$$

$$\underline{10x^3-5x^2}$$

$$2x^2-7x$$

$$\underline{2x^2-x}$$

$$-6x+3$$

$$\underline{-6x+3}$$

PTS: 2 REF: 011809aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

390 ANS: 1

$$\begin{array}{r} 3x^2+4x-1 \\ 2x+3\overline{\big)\,6x^3+17x^2+10x+2} \end{array}$$

$$\underline{6x^3+9x^2}$$

$$8x^2+10x$$

$$\underline{8x^2+12x}$$

$$-2x+2$$

$$\underline{-2x-3}$$

$$5$$

PTS: 2 REF: fall1503aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

391 ANS: 1

$$\begin{array}{r} 3x-1 \\ 3x+1\overline{\big)\,9x^2+0x-2} \end{array}$$

$$\underline{9x^2+3x}$$

$$-3x-2$$

$$\underline{-3x-1}$$

$$-1$$

PTS: 2 REF: 081910aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

392 ANS: 1

$$
\begin{array}{r}
x^2-2x+5 \\
2x+4\overline{\big)\,2x^3+0x^2+2x-7} \\
\underline{2x^3+4x^2} \qquad\qquad \\
-4x^2+2x \qquad \\
\underline{-4x^2-8x} \qquad \\
10x-7 \\
\underline{10x+20} \\
-27
\end{array}
$$

PTS: 2 REF: 062313aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

393 ANS: 1

$$
\begin{array}{r}
2x^2+x+5 \\
2x-1\overline{\big)\,4x^3+0x^2+9x-5} \\
\underline{4x^3-2x^2} \qquad\qquad \\
2x^2+9x \qquad \\
\underline{2x^2-x} \qquad \\
10x-5 \\
\underline{10x-5}
\end{array}
$$

PTS: 2 REF: 081713aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

394 ANS: 2

$$
\begin{array}{r}
2x^2-3x+7 \\
2x+3\overline{\big)\,4x^3+0x^2+5x+10} \\
\underline{4x^3+6x^2} \qquad\qquad \\
-6x^2+5x \qquad \\
\underline{-6x^2-9x} \qquad \\
14x+10 \\
\underline{14x+21} \\
-11
\end{array}
$$

PTS: 2 REF: 061614aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

395 ANS:

$$\begin{array}{r|l} & 3x+13 \\ \hline x-2 & 3x^2+7x-20 \\ & \underline{3x^2-6x} \\ & 13x-20 \\ & \underline{13x-26} \\ & 6 \end{array}$$

$3x+13+\dfrac{6}{x-2}$

PTS: 2 REF: 011732aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

396 ANS:

$$\begin{array}{r|l} & 2a^2+5a+2 \\ \hline 3a-2 & 6a^3+11a^2-4a-9 \\ & \underline{6a^3-4a^2} \\ & 15a^2-4a \\ & \underline{15a^2-10a} \\ & 6a-9 \\ & \underline{6a-4} \\ & -5 \end{array}$$

$2a^2+5a+2-\dfrac{5}{3a-2}$

PTS: 2 REF: 061829aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

397 ANS:

$$\begin{array}{r|l} & 3x^2+8x+34 \\ \hline x-4 & 3x^3-4x^2+2x-1 \\ & \underline{3x^3-12x^2} \\ & 8x^2+2x \\ & \underline{8x^2-32x} \\ & 34x-1 \\ & \underline{34x-136} \\ & 135 \end{array}$$

$3x^2+8x+34+\dfrac{135}{x-4}$ $x=4$ is not a root of $f(x)$ because $\dfrac{f(x)}{g(x)}$ has a remainder.

PTS: 4 REF: 082235aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

398 ANS:

$$\begin{array}{r|l} & x^3 \qquad\quad +4 \\ x+2 & x^4+2x^3+4x-10 \\ & \underline{x^4+2x^3} \\ & \qquad\quad 4x-10 \\ & \qquad\quad \underline{4x+8} \\ & \qquad\quad -18 \end{array}$$

$x^3+4-\dfrac{18}{x+2}$. No, because there is a remainder.

PTS: 4 REF: 011934aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

399 ANS:

$$\frac{p(x)}{x-1}=x^2+7+\frac{5}{x-1}$$

$$p(x)=x^3-x^2+7x-7+5$$

$$p(x)=x^3-x^2+7x-2$$

PTS: 2 REF: 061930aii NAT: A.APR.D.6 TOP: Rational Expressions
KEY: division

400 ANS: 2

$$\frac{x^2+12}{x^2+3}=\frac{x^2+3}{x^2+3}+\frac{9}{x^2+3}=1+\frac{9}{x^2+3}$$

PTS: 2 REF: 062218aii NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

401 ANS: 4

$$\frac{x^2+6}{x^2+4}=\frac{x^2+4}{x^2+4}+\frac{2}{x^2+4}=1+\frac{2}{x^2+4}$$

PTS: 2 REF: 082321aii NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

402 ANS: 1

$$\frac{4x^2-5}{x^2-1}=\frac{4(x^2-1)}{x^2-1}-\frac{1}{x^2-1}$$

PTS: 2 REF: 012510aii NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

403 ANS: 2

$$2-\frac{x-1}{x+2}=1+\frac{x+2}{x+2}-\frac{x-1}{x+2}=1+\frac{x+2-(x-1)}{x+2}=1+\frac{3}{x+2}$$

PTS: 2 REF: 081907aii NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

404 ANS:

$$\frac{x^3+9}{x^3+8}=\frac{x^3+8}{x^3+8}+\frac{1}{x^3+8}$$

$$\frac{x^3+9}{x^3+8}=\frac{x^3+9}{x^3+8}$$

PTS: 2 REF: 061631aii NAT: A.APR.D.7 TOP: Addition and Subtraction of Rationals

405 ANS: 3 PTS: 2 REF: 061722aii NAT: A.CED.A.1
TOP: Modeling Rationals

406 ANS: 3 PTS: 2 REF: 061824aii NAT: A.CED.A.1
TOP: Modeling Rationals

407 ANS: 3 PTS: 2 REF: 061602aii NAT: A.CED.A.1
TOP: Modeling Rationals

Algebra II Regents Exam Questions by State Standard: Topic
Answer Section

408 ANS: 2 PTS: 2 REF: 082222aii NAT: A.CED.A.1
TOP: Modeling Rationals

409 ANS: 1

$$x - \frac{20}{x} = 8$$
$$x^2 - 8x - 20 = 0$$
$$(x-10)(x+2) = 0$$
$$x = 10, -2$$

PTS: 2 REF: 061916aii NAT: A.CED.A.1 TOP: Modeling Rationals

410 ANS:

$$\frac{55}{t} = \frac{65}{t+3}$$
$$65t = 55t + 165$$
$$10t = 165$$
$$t = 16.5$$
$$t + 3 = 19.5$$

PTS: 2 REF: 082431aii NAT: A.CED.A.1 TOP: Modeling Rationals

411 ANS: 3

$$\frac{1}{J} = \frac{1}{F} - \frac{1}{W}$$
$$\frac{1}{J} = \frac{W-F}{FW}$$
$$J = \frac{FW}{W-F}$$

PTS: 2 REF: 081617aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

412 ANS: 4

$$\frac{2}{x}=\frac{4x}{x+3}$$
$$2x+6=4x^2$$
$$4x^2-2x-6=0$$
$$2\left(2x^2-x-3\right)=0$$
$$(2x-3)(x+1)=0$$
$$x=\frac{3}{2},-1$$

PTS: 2 REF: 061809aii NAT: A.REI.A.2 TOP: Solving Rationals

413 ANS: 3

$$\frac{2}{3x+1}=\frac{1}{x}-\frac{6x}{3x+1}$$ $-\frac{1}{3}$ is extraneous.
$$\frac{6x+2}{3x+1}=\frac{1}{x}$$
$$6x^2+2x=3x+1$$
$$6x^2-x-1=0$$
$$(2x-1)(3x+1)=0$$
$$x=\frac{1}{2},-\frac{1}{3}$$

PTS: 2 REF: 011915aii NAT: A.REI.A.2 TOP: Solving Rationals

414 ANS: 4

$$x(x+7)\left[\frac{3x+25}{x+7}-5=\frac{3}{x}\right]$$
$$x(3x+25)-5x(x+7)=3(x+7)$$
$$3x^2+25x-5x^2-35x=3x+21$$
$$2x^2+13x+21=0$$
$$(2x+7)(x+3)=0$$
$$x=-\frac{7}{2},-3$$

PTS: 2 REF: fall1501aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

415 ANS: 3

$$\frac{x+2}{x}+\frac{x}{3}=\frac{2x^2+6}{3x}$$ 0 is extraneous.

$$\frac{x^2+3x+6}{3x}=\frac{2x^2+6}{3x}$$

$$x^2+3x+6=2x^2+6$$

$$x^2-3x=0$$

$$x(x-3)=0$$

$$x=0,3$$

PTS: 2 REF: 012309aii NAT: A.REI.A.2 TOP: Solving Rationals

416 ANS: 4

$$x(x-2)\left(\frac{10}{x^2-2x}+\frac{4}{x}=\frac{5}{x-2}\right)$$ 2 is extraneous.

$$10+4(x-2)=5x$$

$$10+4x-8=5x$$

$$2=x$$

PTS: 2 REF: 081915aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

417 ANS: 1

$$\frac{(x+3)(x+2)}{(x-5)(x+2)}+\frac{6(x-5)}{(x+2)(x-5)}=\frac{6+10x}{(x-5)(x+2)}$$ 5 is extraneous.

$$x^2+5x+6+6x-30=10x+6$$

$$x^2+x-30=0$$

$$(x+6)(x-5)=0$$

$$x=-6,5$$

PTS: 2 REF: 062319aii NAT: A.REI.A.2 TOP: Solving Rationals

418 ANS: 4

$$\frac{x(x-4)}{(x+3)(x-4)}+\frac{2(x+3)}{(x-4)(x+3)}=\frac{2x+27}{(x-4)(x+3)}$$ -3 is extraneous.

$$x^2-4x+2x+6=2x+27$$

$$x^2-2x+6=2x+27$$

$$x^2-4x-21=0$$

$$(x-7)(x+3)=0$$

$$x=7,-3$$

PTS: 2 REF: 082405aii NAT: A.REI.A.2 TOP: Solving Rationals

419 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 NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

420 ANS: 3

$$\frac{4}{k^2-8k+12}=\frac{k(k-6)+(k-2)}{k^2-8k+12}$$ $k=6$ is extraneous

$$4=k^2-6k+k-2$$

$$0=k^2-5k-6$$

$$0=(k-6)(k+1)$$

$$k=6,-1$$

PTS: 2 REF: 082218aii NAT: A.REI.A.2 TOP: Solving Rationals

421 ANS: 3

$$\left(x^2-49\right)\left(\frac{7}{x+7}+\frac{4x}{x-7}=\frac{3x+7}{x-7}\right)$$

$$7(x-7)+4x(x+7)=(3x+7)(x+7)$$

$$7x-49+4x^2+28x=3x^2+21x+7x+49$$

$$4x^2+35x-49=3x^2+28x+49$$

$$x^2+7x-98=0$$

$$(x+14)(x-7)=0$$

$$x=-14,7$$

PTS: 2 REF: 012422aii NAT: A.REI.A.2 TOP: Solving Rationals

422 ANS: 1

$$\frac{2x}{x-2}\left(\frac{x}{x}\right)-\frac{11}{x}\left(\frac{x-2}{x-2}\right)=\frac{8}{x^2-2x}$$

$$2x^2-11x+22=8$$

$$2x^2-11x+14=0$$

$$(2x-7)(x-2)=0$$

$$x=\frac{7}{2},2$$

PTS: 2 REF: 061719aii NAT: A.REI.A.2 TOP: Solving Rationals

423 ANS: 1

$$x-\frac{4}{x-1}=2 \qquad x=\frac{3\pm\sqrt{(-3)^2-4(1)(-2)}}{2(1)}=\frac{3\pm\sqrt{17}}{2}$$

$$x(x-1)-4=2(x-1)$$

$$x^2-x-4=2x-2$$

$$x^2-3x-2=0$$

PTS: 2 REF: 011812aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

424 ANS:

$$\frac{1}{x}-\frac{1}{3}=-\frac{1}{3x}$$

$$\frac{3-x}{3x}=-\frac{1}{3x}$$

$$3-x=-1$$

$$x=4$$

PTS: 2 REF: 061625aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

425 ANS:

$$6x\left(\frac{1}{2x}-\frac{5}{6}=\frac{3}{x}\right)$$

$$3-5x=18$$

$$-15=5x$$

$$-3=x$$

PTS: 2 REF: 012526aii NAT: A.REI.A.2 TOP: Solving Rationals

426 ANS:

$$\frac{3}{n}=\frac{2}{n^2}$$ 0 is an extraneous solution.

$$3n^2=2n$$

$$3n^2-2n=0$$

$$n(3n-2)=0$$

$$n=0,\frac{2}{3}$$

PTS: 2 REF: 062227aii NAT: A.REI.A.2 TOP: Solving Rationals

427 ANS:

$$\frac{3p}{p-5}=\frac{p+2}{p+3}$$

$$3p^2+9p=p^2-3p-10$$

$$2p^2+12p+10=0$$

$$p^2+6p+5=0$$

$$(p+5)(p+1)=0$$

$$p=-5,-1$$

PTS: 4 REF: 081733aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

428 ANS:

$$\frac{8x-3(x+5)}{x(x+5)}=5$$

$$8x-3x-15=5x^2+25x$$

$$0=5x^2+20x+15$$

$$0=x^2+4x+3$$

$$0=(x+3)(x+1)$$

$$x=-3,-1$$

PTS: 2 REF: 062430aii NAT: A.REI.A.2 TOP: Solving Rationals

429 ANS:

$$\frac{7}{2x}-\frac{2}{x+1}=\frac{1}{4}$$

$$\frac{7x+7-4x}{2x^2+2x}=\frac{1}{4}$$

$$2x^2+2x=12x+28$$

$$x^2-5x-14=0$$

$$(x-7)(x+2)=0$$

$$x=7,-2$$

PTS: 2 REF: 061926aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

430 ANS:

$$-6(x+3)\left(\frac{-3}{x+3}-\frac{x}{6}+1=0\right)$$

$$18+x(x+3)-6(x+3)=0$$

$$18+x^2+3x-6x-18=0$$

$$x^2-3x=0$$

$$x(x-3)=0$$

$$x=0,3$$

PTS: 2 REF: 081829aii NAT: A.REI.A.2 TOP: Solving Rationals
KEY: rational solutions

431 ANS:

$$\frac{x-2}{(x-6)(x-2)} + \frac{x(x-6)}{(x-6)(x-2)} = \frac{4}{(x-6)(x-2)}.$$ 6 is extraneous.

$$x-2+x^2-6x=4$$
$$x^2-5x-6=0$$
$$(x-6)(x+1)=0$$
$$x=6,-1$$

PTS: 4 REF: 082334aii NAT: A.REI.A.2 TOP: Solving Rationals

432 ANS:

$$\frac{1}{8}+\frac{1}{6}=\frac{1}{t_b};\ \frac{24t_b}{8}+\frac{24t_b}{6}=\frac{24t_b}{t_b}$$
$$3t_b+4t_b=24$$
$$t_b=\frac{24}{7}\approx 3.4$$

PTS: 2 REF: 011827aii NAT: A.REI.A.2 TOP: Solving Rationals

433 ANS: 4

$$3x-(-2x+14)=16 \quad 3(6)-4z=2$$
$$5x=30 \qquad -4z=-16$$
$$x=6 \qquad z=4$$

PTS: 2 REF: 011803aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

434 ANS: 3

$$6x+8y-10z=-54 \quad 6x+8y-10z=-54 \quad 6x+9y-3z=-9 \quad 10y-7z=-12$$
$$6x+9y-3z=-9 \quad \underline{6x+9y-3z=-9} \quad \underline{6x-y+4z=3} \quad \underline{y+7z=45}$$
$$6x-y+4z=3 \quad y+7z=45 \quad 10y-7z=-12 \quad 11y=33$$
$$y=3$$

PTS: 2 REF: 082421aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

435 ANS: 4

$$z=7y-31 \quad 5x+2y-(7y-31)=-14 \rightarrow 5x-5y=-45 \rightarrow x-y=-9 \rightarrow y=x+9$$

$$5y+4(7y-31)-5x=-23 \rightarrow -5x+33y=101$$

$$-5x+33(x+9)=101$$

$$28x=-196$$

$$x=-7$$

PTS: 2 REF: 012515aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

436 ANS: 1

$$\begin{array}{lll} x+y+z=9 & 4-y-z=-1 & 4-6+z=9 \\ \underline{x-y-z=-1} & 4-y+z=21 & z=11 \\ 2x=8 & -y-z=-5 & \\ x=4 & \underline{-y+z=17} & \\ & -2y=12 & \\ & y=-6 & \end{array}$$

PTS: 2 REF: 012018aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

437 ANS: 2

$$\begin{array}{lllll} x+y-z=6 & 2x+2y-2z=12 & 5y-4z=31 & 5y-2(-4)=23 & x+3-(-4)=6 \\ \underline{-x+4y-z=17} & \underline{2x-3y+2z=-19} & \underline{5y-2z=23} & 5y=15 & x=-1 \\ 5y-2z=23 & 5y-4z=31 & -2z=8 & y=3 & \\ & & z=-4 & & \end{array}$$

PTS: 2 REF: 061923aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

438 ANS: 2

Combining (1) and (3): $-6c=-18$ Combining (1) and (2): $5a+3c=-1$ Using (3): $-(-2)-5b-5(3)=2$

$$c=3 \qquad 5a+3(3)=-1 \qquad 2-5b-15=2$$

$$5a=-10 \qquad b=-3$$

$$a=-2$$

PTS: 2 REF: 081623aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

439 ANS: 3

$$\begin{array}{cccccc}
x+y+z=2 & x-2y-z=-4 & 2x-y=-2 & x+2+z=2 & x+z=0 & 0+2+z=2 \\
\underline{x-2y-z=-4} & \underline{x-9y+z=-18} & \underline{2x-11y=-22} & x-2(2)-z=-4 & \underline{x-z=0} & z=0 \\
2x-y=-2 & 2x-11y=-22 & 10y=20 & & 2x=0 & \\
 & & y=2 & & x=0 &
\end{array}$$

PTS: 2 REF: 062311aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

440 ANS: 2

$$\begin{array}{ccccc}
2x+4y-2z=2 & -x-3y+2z=0 & x+y=2 & 3+2y-z=1 & 2y-z=-2 \\
\underline{-x-3y+2z=0} & \underline{4x-8y+2z=20} & \underline{x-y=4} & 6-4y+z=10 & \underline{2(-1)-z=-2} \\
x+y=2 & 5x-5y=20 & 2x=6 & 2y-z=-2 & z=0 \\
 & x-y=4 & x=3 & \underline{-4y+z=4} & \\
 & & & -2y=2 & \\
 & & & y=-1 &
\end{array}$$

PTS: 2 REF: 062208aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

441 ANS:

$$\begin{array}{ccccc}
6x-3y+2z=-10 & x+3y+5z=45 & 4x+10z=62 & 4x+4(7)=20 & 6(-2)-3y+2(7)=-10 \\
-2x+3y+8z=72 & 6x-3y+2z=-10 & 4x+4z=20 & 4x=-8 & -3y=-12 \\
4x+10z=62 & 7x+7z=35 & 6z=42 & x=-2 & y=4 \\
 & 4x+4z=20 & z=7 & &
\end{array}$$

PTS: 4 REF: spr1510aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

442 ANS:

$$\begin{array}{ccccc}
a+4b+6c=23 & a+2b+c=2 & 8b+3c=16 & 2b+5(4)=21 & a+4\left(\frac{1}{2}\right)+6(4)=23 \\
\underline{a+2b+c=2} & \underline{-a+6b+2c=14} & \underline{8b+20c=84} & 2b=1 & a+2+24=23 \\
2b+5c=21 & 8b+3c=16 & 17c=68 & b=\frac{1}{2} & a=-3 \\
 & & c=4 & &
\end{array}$$

PTS: 4 REF: 011933aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

443 ANS:

$$\begin{array}{llllll}
x+y+z=1 & x+y+z=1 & x+y+z=1 & -2z-z=3 & y-(-1)=3 & x+2-1=1 \\
x+2y+3z=1 & \underline{x+2y+3z=1} & \underline{-x+3y-5z=11} & -3z=3 & y=2 & x=0 \\
-x+3y-5z=11 & y+2z=0 & 4y-4z=12 & z=-1 & & \\
 & y=-2z & y-z=3 & & &
\end{array}$$

PTS: 4 REF: 061733aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

444 ANS:

$$\begin{array}{llllll}
4x+6y-8z=-2 & 4x+6y-8z=-2 & 4x-8y+20z=12 & z+2=3z-4 & y=3+2 & -4x+5+3=16 \\
4x-8y+20z=12 & \underline{-4x+y+z=16} & \underline{-4x+y+z=16} & 6=2z & =5 & -4x=8 \\
-4x+y+z=16 & 7y-7z=14 & -7y+21z=28 & z=3 & & x=-2 \\
 & y-z=2 & y-3z=-4 & & & \\
 & y=z+2 & y=3z-4 & & &
\end{array}$$

PTS: 4 REF: 081833aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

445 ANS:

$$\begin{array}{llllll}
2x+4y-3z=12 & 2x+4y-3z=12 & 8x+z=-6 & 32x+4z=-24 & 8(-1)+z=-6 & -(-1)+y-3(2)=0 \\
2(3x-2y+2z=-9) & 6x-4y+4z=-18 & 2x-8z=-18 & \underline{x-4z=-9} & z=2 & y=5 \\
4(-x+y-3z=0) & -4x+4y-12z=0 & & 33x=-33 & & \\
 & & & x=-1 & &
\end{array}$$

PTS: 4 REF: 082335aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

446 ANS:

$$\begin{array}{lllll}
6x-16y+4z=-120 & 6x-21y-15z=-93 & 6x-16y+4z=-120 & 6+z=3 & -6x+2(6)-4(-3)=36 \\
6x-21y-15z=-93 & \underline{-6x+2y-4z=36} & \underline{-6x+2y-4z=36} & z=-3 & -6x+24=36 \\
-6x+2y-4z=36 & -19y-19z=-57 & -14y=-84 & & -6x=12 \\
 & y+z=3 & y=6 & & x=-2
\end{array}$$

PTS: 4 REF: 062433aii NAT: A.REI.C.6 TOP: Solving Linear Systems
KEY: three variables

447 ANS: 4

$$\begin{array}{ll}
\frac{1}{2}x^2+2x=\frac{1}{4}x-8 & b^2-4ac \\
2x^2+8x=x-32 & 7^2-4(2)(32)<0 \\
2x^2+7x+32=0 &
\end{array}$$

PTS: 2 REF: 012310aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

448 ANS: 2

$$x^2 - 24 = x - 12 \quad y = -3 - 12 = -15$$
$$x^2 - x - 12 = 0$$
$$(x-4)(x+3) = 0$$
$$x = 4, -3$$

PTS: 2 REF: 062404aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

449 ANS: 2

$$x^2 + 4x - 1 = x - 3 \quad y + 3 = -1$$
$$x^2 + 3x + 2 = 0 \quad y = -4$$
$$(x+2)(x+1) = 0$$
$$x = -2, -1$$

PTS: 2 REF: 061801aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

450 ANS: 3

$$(x+4)^2 - 10 = 3x + 6 \quad y = 3(-5) + 6 = -9$$
$$x^2 + 8x + 16 - 10 = 3x + 6 \quad y = 3(0) + 6 = 6$$
$$x^2 + 5x = 0$$
$$x(x+5) = 0$$
$$x = -5, 0$$

PTS: 2 REF: 061903aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

451 ANS: 4

$y = g(x) = (x-2)^2$

$$(x-2)^2 = 3x - 2 \quad y = 3(6) - 2 = 16$$
$$x^2 - 4x + 4 = 3x - 2 \quad y = 3(1) - 2 = 1$$
$$x^2 - 7x + 6 = 0$$
$$(x-6)(x-1) = 0$$
$$x = 6, 1$$

PTS: 2 REF: 011705aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

452 ANS: 4

$$y = -(x-1)^2 + 5 \qquad 3 + y = 4$$
$$4 - x = -x^2 + 2x - 1 + 5 \qquad y = 1$$
$$x^2 - 3x = 0$$
$$x(x-3) = 0$$
$$x = 0, 3$$

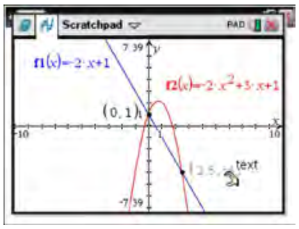
PTS: 2 REF: 082305aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

453 ANS:

$$x^2 + 8x - 5 = 8x - 4$$
$$x^2 - 1 = 0$$
$$x = \pm 1$$

PTS: 2 REF: 082326aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

454 ANS:



$$-2x + 1 = -2x^2 + 3x + 1$$
$$2x^2 - 5x = 0$$
$$x(2x-5) = 0$$
$$x = 0, \frac{5}{2}$$

PTS: 2 REF: fall1507aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

455 ANS:

$$2x^2 - 7x + 4 = 11 - 2x \qquad y = 11 - 2\left(\frac{7}{2}\right) = 4 \qquad \left\{\left(\frac{7}{2}, 4\right), (-1, 13)\right\}$$
$$2x^2 - 5x - 7 = 0 \qquad y = 11 - 2(-1) = 13$$
$$(2x-7)(x+1) = 0$$
$$x = \frac{7}{2}, -1$$

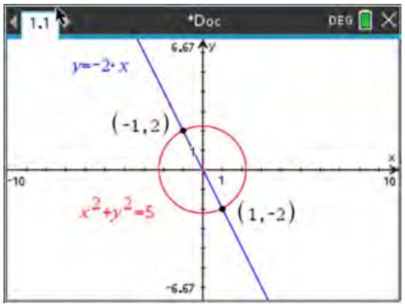
PTS: 2 REF: 082232aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

456 ANS: 1

$$(x+3)^2+(2x-4)^2=8 \qquad b^2-4ac$$
$$x^2+6x+9+4x^2-16x+16=8 \quad 100-4(5)(17)<0$$
$$5x^2-10x+17=0$$

PTS: 2 REF: 081719aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

457 ANS: 4



$$x^2+(-2x)^2=5 \quad y=-2(-1)=2$$
$$5x^2=5$$
$$x^2=1$$
$$x=\pm 1$$

PTS: 2 REF: 012407aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

458 ANS: 3

$$x^2+(2x)^2=5 \quad y=2x=\pm 2$$
$$x^2+4x^2=5$$
$$5x^2=5$$
$$x=\pm 1$$

PTS: 2 REF: 081916aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

459 ANS:

$$x^2+(2x-5)^2=25 \quad y+5=2(0) \quad y+5=2(4) \quad (0,-5),(4,3)$$
$$x^2+4x^2-20x+25=25 \qquad y=-5 \qquad y=3$$
$$5x^2-20x=0$$
$$5x(x-4)=0$$
$$x=0,4$$

PTS: 4 REF: 062236aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

460 ANS:

$x^2+(x-28)^2=400 \quad y=12-28=-16 \quad y=16-28=-12$

$x^2+x^2-56x+784=400$

$2x^2-56x+384=0$

$x^2-28x+192=0$

$(x-16)(x-12)=0$

$x=12,16$

PTS: 2 REF: 081831aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

461 ANS:

$(x-2)^2+(-2x+7-3)^2=20 \quad y=-2(0)+7=7 \quad (0,7),(4,-1)$

$(x-2)^2+(-2x+4)^2=20 \quad y=-2(4)+7=-1$

$x^2-4x+4+4x^2-16x+16=20$

$5x^2-20x=0$

$5x(x-4)=0$

$x=0,4$

PTS: 4 REF: 062335aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

462 ANS:

$(x-4)^2+((x-6)-1)^2=9 \quad 7-y=6 \quad 4-y=6 \quad (7,1),(4,-2)$

$x^2-8x+16+x^2-14x+49-9=0 \quad 1=y \quad -2=y$

$2x^2-22x+56=0$

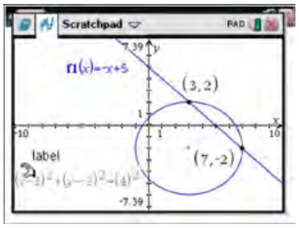
$x^2-11x+28=0$

$(x-7)(x-4)=0$

$x=7,4$

PTS: 4 REF: 082436aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

463 ANS:



$$y=-x+5 \quad y=-7+5=-2$$

$$(x-3)^2+(-x+5+2)^2=16 \quad y=-3+5=2$$

$$x^2-6x+9+x^2-14x+49=16$$

$$2x^2-20x+42=0$$

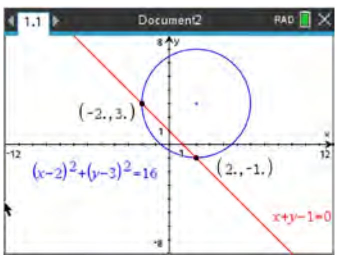
$$x^2-10x+21=0$$

$$(x-7)(x-3)=0$$

$$x=7,3$$

PTS: 4 REF: 061633aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

464 ANS:



$$y=-x+1 \quad y=-2+1=-1 \quad (2,-1)$$

$$(x-2)^2+(-x+1-3)^2=16 \quad y=2+1=3 \quad (-2,3)$$

$$x^2-4x+4+x^2+4x+4=16$$

$$2x^2=8$$

$$x=-2,2$$

PTS: 4 REF: 012035aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

465 ANS: 3

$$-33t^2+360t=700+5t$$

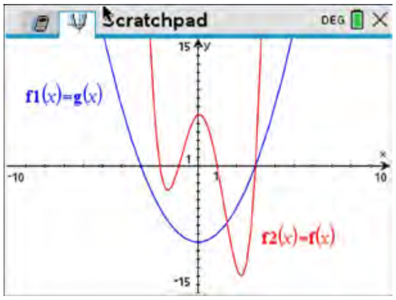
$$-33t^2+355t-700=0$$

$$t=\frac{-355\pm\sqrt{355^2-4(-33)(-700)}}{2(-33)}\approx 3,8$$

PTS: 2 REF: 081606aii NAT: A.REI.D.11 TOP: Quadratic-Linear Systems

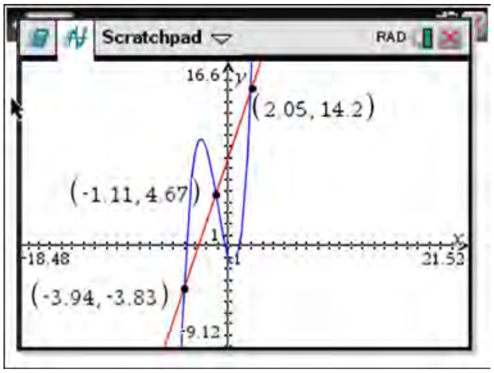
466 ANS: 4 PTS: 2 REF: 061914aii NAT: A.REI.D.11
TOP: Other Systems KEY: table

467 ANS: 2



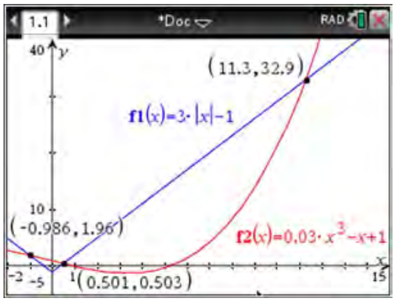
PTS: 2 REF: 082319aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

468 ANS: 4



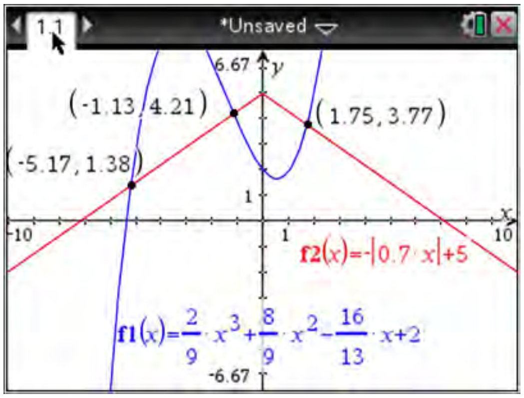
PTS: 2 REF: 061622aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

469 ANS: 2



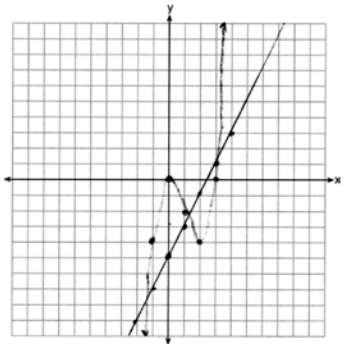
PTS: 2 REF: 061705aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

470 ANS:



PTS: 2 REF: fall1510aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

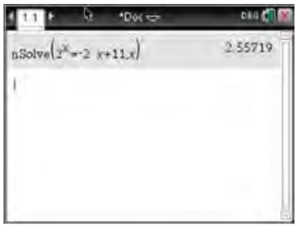
471 ANS:



3

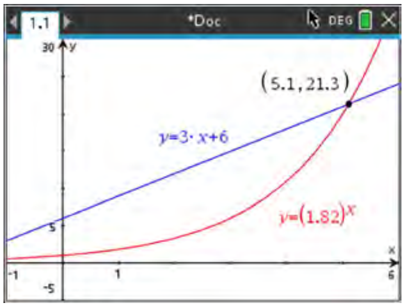
PTS: 4 REF: 062233aii NAT: A.REI.D.11 TOP: Other Systems
KEY: polynomial

472 ANS: 2



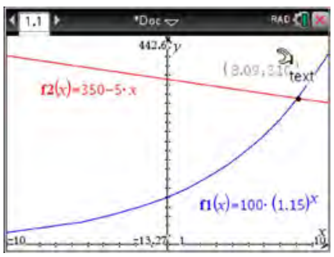
PTS: 2 REF: 081603aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

473 ANS: 3



PTS: 2 REF: 012406aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

474 ANS: 2



PTS: 2 REF: 011716aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

475 ANS: 1

$$1240(1.06)^x = 890(1.11)^x$$
$$x \approx 7$$

PTS: 2 REF: 061814aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

476 ANS:

$A(t) = 4000\left(1 + \dfrac{2.4\%}{12}\right)^{12t}$ $B(t) = 3500\left(1 + \dfrac{4\%}{4}\right)^{4t}$ 8.4, the value of t for which $A(t) = B(t)$

PTS: 4 REF: 012435aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

477 ANS:

$$20e^{.05t} = 30e^{.03t}$$

$$\frac{\frac{2}{3}e^{.05t}}{e^{.05t}} = \frac{e^{.03t}}{e^{.05t}}$$

$$\ln\frac{2}{3} = \ln e^{-.02t}$$

$$\ln\frac{2}{3} = -.02t\ln e$$

$$\frac{\ln\frac{2}{3}}{-.02} = t$$

$$20.3 \approx t$$

PTS: 2 REF: 011829aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

478 ANS:

$P(x) = 500(0.97)^x$; 18; The number of palm trees and flamingos will be equal in 18 years.

$F(x) = 200e^{0.02x}$

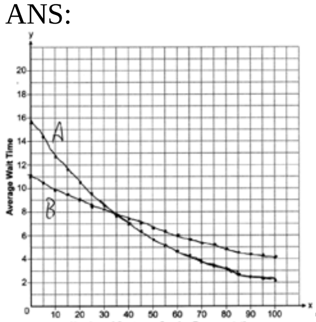
PTS: 4 REF: 062336aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

479 ANS:

$T = (400-75)e^{-0.0735t} + 75$, $325e^{-0.0735(5)} + 75 \approx 300$, $270 = (450-75)e^{-8r} + 75$, $r \approx 0.0817$, $325e^{-0.0735t} + 75 = 375e^{-0.0817t} + 75$, $t \approx 17$

PTS: 6 REF: 012337aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

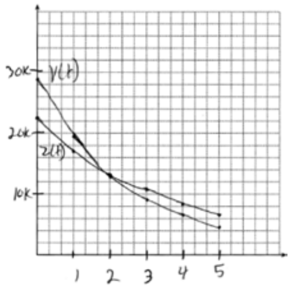
480 ANS:

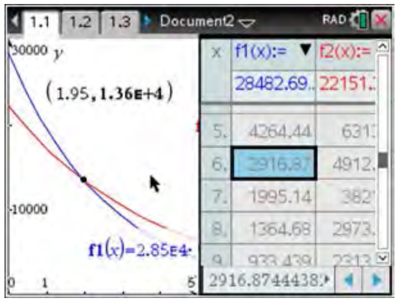


35; $B(100) - A(100) \approx 2$, which represents the difference of the average wait time when there are 100 CSRs between the plans.

PTS: 6 REF: 082237aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

481 ANS:

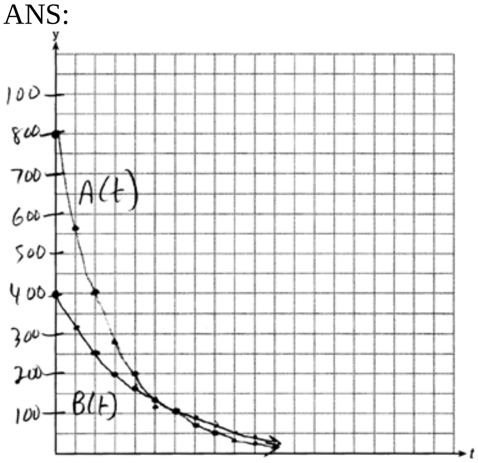




At 1.95 years, the value of the car equals the loan balance. Zach can cancel the policy after 6 years.

PTS: 4 REF: 081737aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

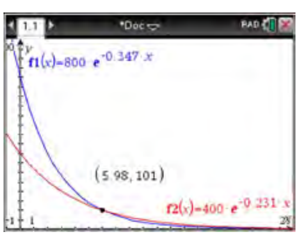
482 ANS:

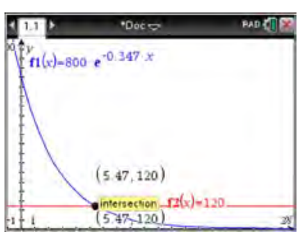


$$A(t) = 800e^{-0.347t}$$
$$B(t) = 400e^{-0.231t}$$

$$800e^{-0.347t} = 400e^{-0.231t}$$
$$\ln 2e^{-0.347t} = \ln e^{-0.231t}$$
$$\ln 2 + \ln e^{-0.347t} = \ln e^{-0.231t}$$
$$\ln 2 - 0.347t = -0.231t$$
$$\ln 2 = 0.116t$$
$$6 \approx t$$

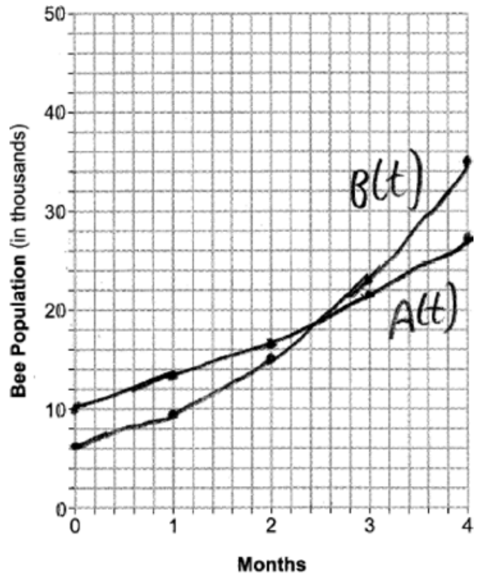
$$0.15 = e^{-0.347t}$$
$$\ln 0.15 = \ln e^{-0.347t}$$
$$\ln 0.15 = -0.347t \cdot \ln e$$
$$5.5 \approx t$$





PTS: 6 REF: 061637aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

483 ANS:



$A(t) = 10000e^{0.25t}$

$B(t) = 6000e^{0.45t}$

2.6 months for same. $30000 = 10000e^{0.25t}$

$$\ln 3 = \ln e^{0.25t}$$

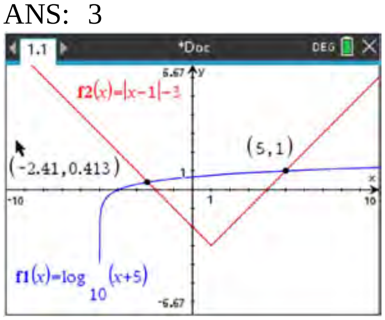
$$\ln 3 = 0.25t \ln e$$

$$\frac{\ln 3}{0.25} = t$$

$$4.4 \approx t$$

PTS: 6 REF: 012537aii NAT: A.REI.D.11 TOP: Other Systems
KEY: exponential

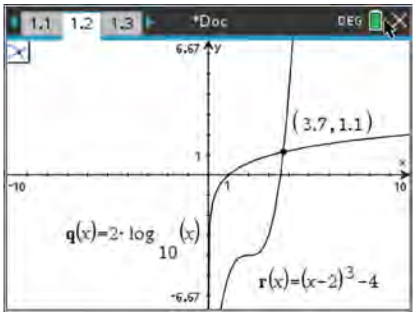
484 ANS: 3



PTS: 2 REF: 012317aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

485 ANS: 1 PTS: 2 REF: 011814aii NAT: A.REI.D.11
TOP: Other Systems KEY: logarithmic

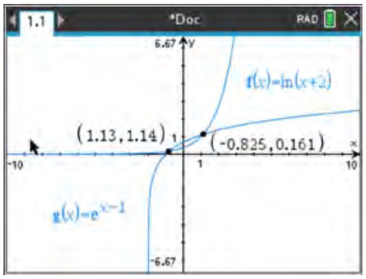
486 ANS: 2



PTS: 2 REF: 082417aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

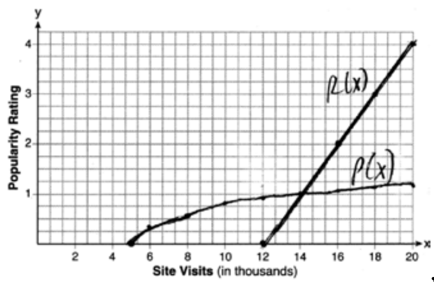
487 ANS: 3 PTS: 2 REF: 081819aii NAT: A.REI.D.11
TOP: Other Systems KEY: logarithmic

488 ANS: 2



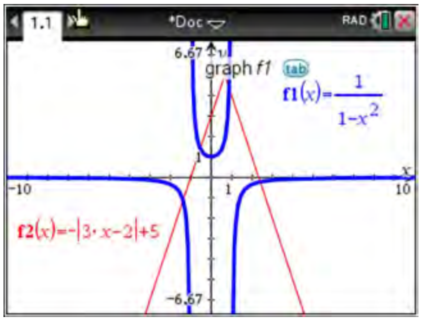
PTS: 2 REF: 081920aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

489 ANS:

$P(16) = \log(16 - 4) \approx 1.1$,  , 14000

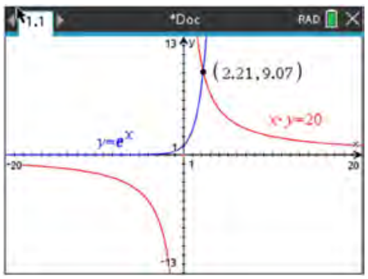
PTS: 6 REF: 061837aii NAT: A.REI.D.11 TOP: Other Systems
KEY: logarithmic

490 ANS: 4



PTS: 2 REF: 011924aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

491 ANS: 1



PTS: 2 REF: 082210aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

492 ANS: 2

$$2x\left(2x+\frac{5}{2}=\frac{3}{x}\right)$$

$$4x^2+5x=6$$

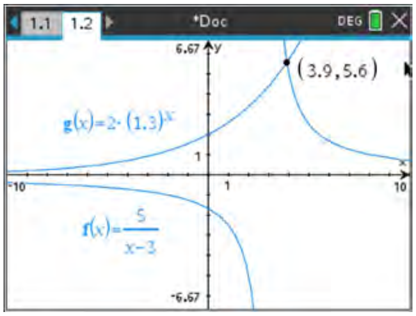
$$4x^2+5x-6=0$$

$$(4x-3)(x+2)=0$$

$$x=\frac{3}{4},-2$$

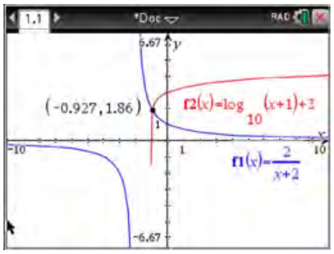
PTS: 2 REF: 012504aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

493 ANS: 2



PTS: 2 REF: 062402aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

494 ANS: 2



PTS: 2 REF: 011712aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

495 ANS:

antibiotic $n(0)=\dfrac{0+1}{0+5}+\dfrac{18}{0^2+8(0)+15}=\dfrac{3}{15}+\dfrac{18}{15}=\dfrac{21}{15}$

$a(0)=\dfrac{9}{0+3}=3$

$$\frac{t+1}{t+5}+\frac{18}{t^2+8t+15}=\frac{9}{t+3}$$

$$\frac{(t+1)(t+3)}{(t+5)(t+3)}+\frac{18}{(t+3)(t+5)}=\frac{9(t+5)}{(t+3)(t+5)}$$

$$t^2+4t+3+18=9t+45$$

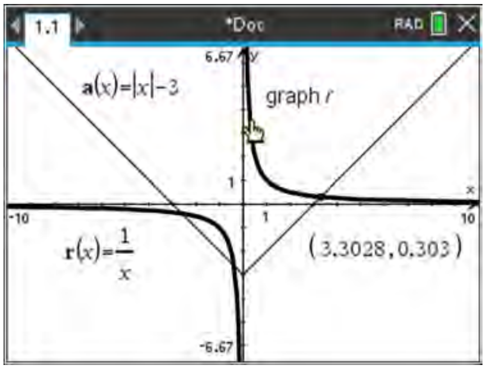
$$t^2-5t-24=0$$

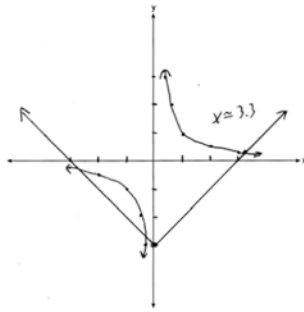
$$(t-8)(t+3)=0$$

$$t=8$$

PTS: 6 REF: 012037aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

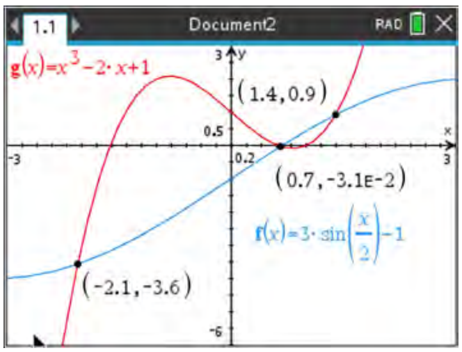
496 ANS:





PTS: 2 REF: 081932aii NAT: A.REI.D.11 TOP: Other Systems
KEY: rational

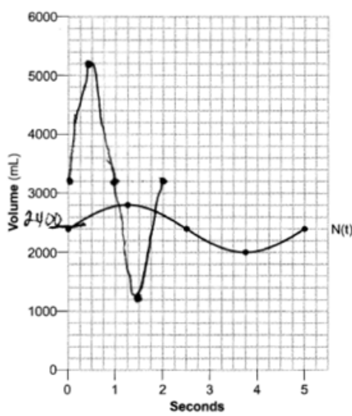
497 ANS: 2



PTS: 2 REF: 012021aii NAT: A.REI.D.11 TOP: Other Systems
KEY: trigonometric

498 ANS:

$N(t) = 400\sin\left(\frac{2\pi}{5}t\right) + 2400.$



4 times.

PTS: 6 REF: 062337aii NAT: A.REI.D.11 TOP: Other Systems
KEY: trigonometric

499 ANS: 3

$$x^2 - 6x + 9 - \left(x^2 + 6x + 9\right) = -12x$$

PTS: 2 REF: 062210aii NAT: F.BF.A.1 TOP: Operations with Functions

500 ANS: 2

$$3x^2 - 7x + 25 - (7x^2 - 10x + 22) = -4x^2 + 3x + 3$$

PTS: 2 REF: 012513aii NAT: F.BF.A.1 TOP: Operations with Functions

501 ANS: 4 PTS: 2 REF: 081803aii NAT: F.BF.A.1
TOP: Operations with Functions

502 ANS: 4

$$\frac{m(c)}{g(c)} = \frac{c+1}{1-c^2} = \frac{c+1}{(1+c)(1-c)} = \frac{1}{1-c}$$

PTS: 2 REF: 061608aii NAT: F.BF.A.1 TOP: Operations with Functions

503 ANS: 3 PTS: 2 REF: 011710aii NAT: F.BF.A.1
TOP: Operations with Functions

504 ANS: 1

$$\frac{f(x)}{g(x)} = \frac{2x^2 + 7x - 15}{3 - 2x} = \frac{(2x-3)(x+5)}{-(2x-3)} = \frac{x+5}{-1} = -x - 5$$

PTS: 2 REF: 012412aii NAT: F.BF.A.1 TOP: Operations with Functions

505 ANS: 2

$$V(x) = x(18 - 2x)(18 - 2x) = x(324 - 72x + 4x^2) = 324x - 72x^2 + 4x^3$$

PTS: 2 REF: 082418aii NAT: F.BF.A.1 TOP: Operations with Functions

506 ANS: 3 PTS: 2 REF: 012002aii NAT: F.BF.A.1
TOP: Operations with Functions

507 ANS: 3

$$95.4x - 6x^2 - (0.18x^3 + 0.02x^2 + 4x + 180)$$

PTS: 2 REF: 082322aii NAT: F.BF.A.1 TOP: Operations with Functions

508 ANS: 2

$$\begin{aligned} x(30 - 0.01x) - (0.15x^3 + 0.01x^2 + 2x + 120) &= 30x - 0.01x^2 - 0.15x^3 - 0.01x^2 - 2x - 120 \\ &= -0.15x^3 - 0.02x^2 + 28x - 120 \end{aligned}$$

PTS: 2 REF: 061709aii NAT: F.BF.A.1 TOP: Operations with Functions

509 ANS: 1

$$\begin{aligned} p(x) &= r(x) - c(x) \\ -0.5x^2 + 250x - 300 &= -0.3x^2 + 150x - c(x) \\ c(x) &= 0.2x^2 - 100x + 300 \end{aligned}$$

PTS: 2 REF: 061813aii NAT: F.BF.A.1 TOP: Operations with Functions

510 ANS: 3

$p(x) = r(x) - c(x)$

$-15x^2 + 600x + 60 = -0.4x^2 + 130x + 1200 - c(x)$

$c(x) = 14.6x^2 - 470x + 1140$

PTS: 2 REF: 062421aii NAT: F.BF.A.1 TOP: Operations with Functions

511 ANS:

$\left(2x^2 + x - 3\right) \bullet (x-1) - \left[\left(2x^2 + x - 3\right) + (x-1)\right]$

$\left(2x^3 - 2x^2 + x^2 - x - 3x + 3\right) - \left(2x^2 + 2x - 4\right)$

$2x^3 - 3x^2 - 6x + 7$

PTS: 4 REF: 011833aii NAT: F.BF.A.1 TOP: Operations with Functions

512 ANS:

$\left(x^3 + 2x - 1\right)\left(x^2 + 7\right) - 3\left(x^4 - 5x\right)$

$x^5 + 7x^3 + 2x^3 + 14x - x^2 - 7 - 3x^4 + 15x$

$x^5 - 3x^4 + 9x^3 - x^2 + 29x - 7$

PTS: 2 REF: 012330aii NAT: F.BF.A.1 TOP: Operations with Functions

513 ANS: 1 PTS: 2 REF: 081903aii NAT: F.LE.A.2
TOP: Families of Functions

514 ANS: 3 PTS: 2 REF: 061906aii NAT: F.LE.A.2
TOP: Families of Functions

515 ANS: 1

2) linear, 3) quadratic, 4) cubic

PTS: 2 REF: 061920aii NAT: F.LE.A.2 TOP: Families of Functions

516 ANS: 4 PTS: 2 REF: 081817aii NAT: F.BF.B.3
TOP: Transformations with Functions

517 ANS: 3 PTS: 2 REF: 062205aii NAT: F.BF.B.3
TOP: Transformations with Functions

518 ANS: 4

I. Minimum does not change, only period; II. $-16 + 8 = -8$; III. $\frac{1}{2}(-16) = -8$

PTS: 2 REF: 012523aii NAT: F.BF.B.3 TOP: Transformations with Functions

519 ANS:

$f(x) = x^2(x+4)(x-3)$; $g(x) = (x+2)^2(x+6)(x-1)$

PTS: 4 REF: 011836aii NAT: F.BF.B.3 TOP: Transformations with Functions

520 ANS: 3
$f(x) = -f(x)$, so $f(x)$ is odd. $g(-x) \neq g(x)$, so $g(x)$ is not even. $g(-x) \neq -g(x)$, so $g(x)$ is not odd. $h(-x) = h(x)$, so $h(x)$ is even.

PTS: 2 REF: fall1502aii NAT: F.BF.B.3 TOP: Even and Odd Functions

521 ANS: 2

$$f(x) = f(-x)$$
$$x^2 + 1 = (-x)^2 + 1$$
$$x^2 + 1 = x^2 + 1$$

PTS: 2 REF: 082323aii NAT: F.BF.B.3 TOP: Even and Odd Functions

522 ANS: 2

$$f(x) = f(-x)$$
$$x^2 - 4 = (-x)^2 - 4$$
$$x^2 - 4 = x^2 - 4$$

PTS: 2 REF: 061806aii NAT: F.BF.B.3 TOP: Even and Odd Functions

523 ANS: 1
The graph of $y = \sin x$ is unchanged when rotated 180º about the origin.

PTS: 2 REF: 081614aii NAT: F.BF.B.3 TOP: Even and Odd Functions

524 ANS: 2 PTS: 2 REF: 081911aii NAT: F.BF.B.3
TOP: Even and Odd Functions

525 ANS: 1 PTS: 2 REF: 062318aii NAT: F.BF.B.3
TOP: Even and Odd Functions

526 ANS:
No, because a 180º rotation of *f* about the origin does not map *f* onto itself.

PTS: 2 REF: 062432aii NAT: F.BF.B.3 TOP: Even and Odd Functions

527 ANS:
$j(-x) = (-x)^4 - 3(-x)^2 - 4 = x^2 - 3x^2 - 4$ Since $j(x) = j(-x)$, the function is even.

PTS: 2 REF: 081731aii NAT: F.BF.B.3 TOP: Even and Odd Functions

528 ANS: 2

$$x = 4y + 5$$
$$x - 5 = 4y$$
$$\frac{1}{4}x - \frac{5}{4} = y$$

PTS: 2 REF: 061909aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

529 ANS: 3

$$x = 12y - 4$$
$$x + 4 = 12y$$
$$\frac{x+4}{12} = y$$

PTS: 2 REF: 082304aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

530 ANS: 3

$$x = \frac{1}{2}y + 2$$
$$2x = y + 4$$
$$y = 2x - 4$$

PTS: 2 REF: 012315aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

531 ANS: 2

$$y = \frac{1}{2}x + 8 \quad x = \frac{1}{2}y + 8$$
$$2x = y + 16$$
$$y = 2x - 16$$

PTS: 2 REF: 081806aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

532 ANS: 2

$$x = -6(y - 2)$$
$$-\frac{x}{6} = y - 2$$
$$-\frac{x}{6} + 2 = y$$

PTS: 2 REF: 011821aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

533 ANS: 3

$y = -6x + \frac{1}{2}$

$x = -6y + \frac{1}{2}$

$x - \frac{1}{2} = -6y$

$-\frac{1}{6}\left(x - \frac{1}{2}\right) = y$

PTS: 2 REF: 062217aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

534 ANS: 3

$x = -\frac{2y}{5} + 4 \quad y = -\frac{5}{2}(6) + 10 = -5$

$5x = -2y + 20$

$2y = -5x + 20$

$y = -\frac{5}{2}x + 10$

PTS: 2 REF: 082223aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

535 ANS: 2

$x = -\frac{3}{4}y + 2$

$-4x = 3y - 8$

$-4x + 8 = 3y$

$-\frac{4}{3}x + \frac{8}{3} = y$

PTS: 2 REF: 061616aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

536 ANS: 3

$x = \frac{2}{3}y + \frac{1}{6}$

$6x = 4y + 1$

$4y = 6x - 1$

$y = \frac{6}{4}x - \frac{1}{4}$

PTS: 2 REF: 062321aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: linear

537 ANS: 4

$y = \sqrt[3]{x+2}$

$x = \sqrt[3]{y+2}$

$x^3 = y+2$

$y = x^3 - 2$

PTS: 2 REF: 062419aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

538 ANS: 2

$y = \sqrt[3]{x} + 4$

$x = \sqrt[3]{y} + 4$

$x - 4 = \sqrt[3]{y}$

$(x-4)^3 = y$

PTS: 2 REF: 012519aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

539 ANS: 2

$y = x^3 - 3$

$x = y^3 - 3$

$x + 3 = y^3$

$\sqrt[3]{x+3} = y$

PTS: 2 REF: 012419aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

540 ANS: 3

$y = x^3 - 2$

$x = y^3 - 2$

$x + 2 = y^3$

$\sqrt[3]{x+2} = y$

PTS: 2 REF: 061815aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

541 ANS:

$$x=(y-3)^3+1$$
$$x-1=(y-3)^3$$
$$\sqrt[3]{x-1}=y-3$$
$$\sqrt[3]{x-1}+3=y$$
$$f^{-1}(x)=\sqrt[3]{x-1}+3$$

PTS: 2 REF: fall1509aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: cubic

542 ANS: 2

$$x=\frac{y}{y+2}$$
$$xy+2x=y$$
$$xy-y=-2x$$
$$y(x-1)=-2x$$
$$y=\frac{-2x}{x-1}$$

PTS: 2 REF: 081924aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: rational

543 ANS: 2

$$x=\frac{y+1}{y-2}$$
$$xy-2x=y+1$$
$$xy-y=2x+1$$
$$y(x-1)=2x+1$$
$$y=\frac{2x+1}{x-1}$$

PTS: 2 REF: 081714aii NAT: F.BF.B.4 TOP: Inverse of Functions
KEY: rational

544 ANS: 4

The maximum of p is 5. The minimum of f is $-\frac{21}{4}$ $\left(x=\frac{-6}{2(4)}=-\frac{3}{4}\right.$

$$f\left(-\frac{3}{4}\right)=4\left(-\frac{3}{4}\right)^2+6\left(-\frac{3}{4}\right)-3=4\left(\frac{9}{16}\right)-\frac{18}{4}-\frac{12}{4}=-\frac{21}{4}).\ \ \frac{20}{4}-\left(-\frac{21}{4}\right)=\frac{41}{4}=10.25$$

PTS: 2 REF: 011922aii NAT: F.IF.C.9 TOP: Comparing Functions

545 ANS: 4
$f(0) = 4\sin(2(0)) = 0$; $g(0) = 3(0)^4 + 2(0)^3 + 7 = 7$; $h(0) = 5e^{2(0)} + 3 = 8$; $j(0) = 6\log_2(3(0) + 4) = 12$

PTS: 2 REF: 082310aii NAT: F.IF.C.9 TOP: Comparing Functions
546 ANS: 1 PTS: 2 REF: 081804aii NAT: F.IF.C.9
TOP: Comparing Functions
547 ANS: 4 PTS: 2 REF: 062309aii NAT: F.IF.C.9
TOP: Comparing Functions
548 ANS: 2
$h(x)$ does not have a y-intercept.

PTS: 2 REF: 011719aii NAT: F.IF.C.9 TOP: Comparing Functions
549 ANS: 2 PTS: 2 REF: 062222aii NAT: F.IF.C.9
TOP: Comparing Functions
550 ANS:
$0 = \log_{10}(x - 4)$ The x-intercept of h is $(2,0)$. f has the larger value.

$$10^0 = x - 4$$
$$1 = x - 4$$
$$x = 5$$

PTS: 2 REF: 081630aii NAT: F.IF.C.9 TOP: Comparing Functions
551 ANS:
q has the smaller minimum value for the domain $[-2,2]$. h's minimum is $-1\ \left(2(-1)+1\right)$ and q's minimum is -8.

PTS: 2 REF: 011830aii NAT: F.IF.C.9 TOP: Comparing Functions
552 ANS: 1
$$\frac{-12}{16} = \frac{9}{-12} = \frac{-6.75}{9}$$

PTS: 2 REF: 012017aii NAT: F.IF.A.3 TOP: Sequences
KEY: difference or ratio
553 ANS: 3 PTS: 2 REF: 061910aii NAT: F.IF.A.3
TOP: Sequences KEY: difference or ratio
554 ANS: 2
$$a_2 = 8 + \log_{2+1} 1 = 8 + 0 = 8$$
$$a_3 = 8 + \log_{3+1} 2 = 8 + \frac{1}{2} = 8.5$$

PTS: 2 REF: 062221aii NAT: F.IF.A.3 TOP: Sequences
KEY: recursive

555 ANS:

$a_1 = 3 \;\; a_2 = 7 \;\;\; a_3 = 15 \;\;\; a_4 = 31$; No, because there is no common ratio: $\frac{7}{3} \neq \frac{15}{7}$

PTS: 2 REF: 061830aii NAT: F.IF.A.3 TOP: Sequences
KEY: recursive

556 ANS: 2

$121(b)^2 = 64 \quad 64\left(\frac{8}{11}\right)^2 \approx 34$

$b = \frac{8}{11}$

PTS: 2 REF: 011904aii NAT: F.BF.A.2 TOP: Sequences
KEY: explicit

557 ANS: 3

$r = \frac{-2\sqrt{3}}{\sqrt{6}} = \frac{-2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{-2\sqrt{2}}{2} = -\sqrt{2} \;\; a_7 = \sqrt{6}(-\sqrt{2})^{7-1} = \sqrt{6}(-\sqrt{2})^6 = \sqrt{6} \cdot 2^3 = 8\sqrt{6}$

PTS: 2 REF: 012410aii NAT: F.BF.A.2 TOP: Sequences
KEY: explicit

558 ANS: 1

$d = 18; \;\; r = \pm\frac{5}{4}$

PTS: 2 REF: 011714aii NAT: F.BF.A.2 TOP: Sequences
KEY: explicit

559 ANS:

$\frac{6.25 - 2.25}{21 - 5} = \frac{4}{16} = \$.25$ fine per day. $2.25 - 5(.25) = \$1$ replacement fee. $a_n = 1.25 + (n-1)(.25)$. $a_{60} = \$16$

PTS: 4 REF: 081734aii NAT: F.BF.A.2 TOP: Sequences
KEY: explicit

560 ANS: 3 PTS: 2 REF: 011824aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

561 ANS: 4

$a_1 = 2.5 + 0.5(1) = 3$

PTS: 2 REF: 011916aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

562 ANS: 3 PTS: 2 REF: 081618aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

563 ANS: 4

(1) and (3) are not recursive

PTS: 2 REF: 012013aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

564 ANS: 4
1) is a correct formula, but not recursive

PTS: 2 REF: 082216aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

565 ANS: 1
(2) is not recursive

PTS: 2 REF: 081608aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

566 ANS: 4 PTS: 2 REF: 062412aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

567 ANS: 3 PTS: 2 REF: 061623aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

568 ANS: 4 PTS: 2 REF: 081624aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

569 ANS: 4 PTS: 2 REF: 081810aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

570 ANS: 3 PTS: 2 REF: 081909aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

571 ANS: 2 PTS: 2 REF: 012321aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

572 ANS: 3 PTS: 2 REF: 081724aii NAT: F.BF.A.2
TOP: Sequences KEY: recursive

573 ANS: 4
The scenario represents a decreasing geometric sequence with a common ratio of 0.80.

PTS: 2 REF: 061610aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

574 ANS:

$a_1 = 4$

$a_n = 3a_{n-1}$

PTS: 2 REF: 081931aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

575 ANS:

$\frac{9}{6} = 1.5 \quad a_1 = 6$

$a_n = 1.5 \cdot a_{n-1}$

PTS: 2 REF: 061931aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

576 ANS:

$\frac{63}{189} = \frac{1}{3}$ $a_1 = 189$

$a_n = \frac{1}{3} a_{n-1}$

PTS: 2 REF: 062329aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

577 ANS:

$\frac{20}{8} = 2.5$ $a_1 = 8$

$a_n = 2.5 \cdot a_{n-1}$

PTS: 2 REF: 012531aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

578 ANS:

$a_1 = 4$ $a_8 = 639$

$a_n = 2a_{n-1} + 1$

PTS: 2 REF: 081729aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

579 ANS:

$a_1 = 12$

$a_n = a_{n-1} + 6$

PTS: 2 REF: 012430aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

580 ANS:

1.5%; $P(t) = 92.2(1.015)^t$;

$$\frac{300}{92.2} = (1.015)^t$$

$$\log\frac{300}{92.2} = t\log(1.015)$$

$$\frac{\log\frac{300}{92.2}}{\log(1.015)} = t$$

$$t \approx 79$$

PTS: 6 REF: 062237aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

581 ANS:

$a_n = x^{n-1}(x+1)$ $x^{n-1} = 0$ $x+1=0$

$x = 0$ $x = -1$

PTS: 4 REF: spr1511aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

582 ANS:

Jillian's plan, because distance increases by one mile each week. $a_1 = 10$ $a_n = n + 12$

$a_n = a_{n-1} + 1$

PTS: 4 REF: 011734aii NAT: F.BF.A.2 TOP: Sequences
KEY: recursive

583 ANS: 3 PTS: 2 REF: 061720aii NAT: F.BF.A.2
TOP: Sequences KEY: function notation

584 ANS: 1 PTS: 2 REF: 081609aii NAT: F.BF.B.6
TOP: Sigma Notation KEY: represent

585 ANS: 1 PTS: 2 REF: 082221aii NAT: F.BF.B.6
TOP: Sigma Notation KEY: represent

586 ANS: 1 PTS: 2 REF: 081813aii NAT: F.BF.B.7
TOP: Series KEY: geometric

587 ANS: 4 PTS: 2 REF: 012423aii NAT: F.BF.B.7
TOP: Series KEY: geometric

588 ANS: 2 PTS: 2 REF: 062324aii NAT: F.BF.B.7
TOP: Series KEY: geometric

589 ANS: 2 PTS: 2 REF: 061724aii NAT: F.BF.B.7
TOP: Series KEY: geometric

590 ANS: 3

$$S_{20} = \frac{-2-(-2)(-3)^{20}}{1-(-3)} = 1{,}743{,}392{,}200$$

PTS: 2 REF: 012306aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

591 ANS: 3

$8r^3 = 216$ $S_{12} = \dfrac{8-8(3)^{12}}{1-3} = 2125760$

$r^3 = 27$

$r = 3$

PTS: 2 REF: 081902aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

592 ANS: 4

$$S_n = \frac{32 - 32(.8)^{12}}{1 - .8} \approx 149$$

PTS: 2 REF: 081721aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

593 ANS: 4

$$S_{15} = \frac{10 - 10(1.09)^{15}}{1 - 1.09} \approx 293.609$$

PTS: 2 REF: 062424aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

594 ANS: 4

$$S_5 = \frac{350 - 350(1.15)^5}{1 - 1.15} \approx 2360$$

PTS: 2 REF: 012524aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

595 ANS: 4

$$S_7 = \frac{85000 - 85000(1.06)^7}{1 - 1.06} \approx 713476.20$$

PTS: 2 REF: 061905aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

596 ANS: 4

$$S_{10} = \frac{90000 - 90000(1.02)^{10}}{1 - 1.02} \approx 985,475$$

PTS: 2 REF: 082424aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

597 ANS: 2

$$S_{20} = \frac{.01 - .01(3)^{20}}{1 - 3} = 17,433,922$$

PTS: 2 REF: 011822aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

598 ANS:

$$r = \frac{360}{300} = 1.2 \quad S_n = \frac{300 - 300(1.2)^n}{1 - 1.2} \quad S_{10} = \frac{300 - 300(1.2)^{10}}{1 - 1.2} \approx 7787.6$$

PTS: 2 REF: 012029aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

599 ANS:

$$S_5 = \frac{6 - 6(.8)^5}{1 - .8} \approx 20.17$$

PTS: 2 REF: 062226aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

600 ANS:

$$S_{10} = \frac{15 - 15(1.03)^{10}}{1 - 1.03} \approx 171.958$$

PTS: 2 REF: 011929aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

601 ANS:

$a_n = 100(.8)^{n-1}$ $S_{20} = \dfrac{100 - 100(.8)^{20}}{1 - .8} \approx 494$ No, because $494 > 40 \times 12$.

PTS: 4 REF: 012033aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

602 ANS:

$$S_n = \frac{33000 - 33000(1.04)^n}{1 - 1.04} \quad S_{15} = \frac{33000 - 33000(1.04)^{15}}{1 - 1.04} \approx 660778.39$$

PTS: 4 REF: 061634aii NAT: F.BF.B.7 TOP: Series
KEY: geometric

603 ANS: 2 PTS: 2 REF: 062219aii NAT: F.TF.A.1
TOP: Unit Circle

604 ANS: 1 PTS: 2 REF: 081616aii NAT: F.TF.A.1
TOP: Unit Circle KEY: bimodalgraph

605 ANS: 4 PTS: 2 REF: 082205aii NAT: F.TF.A.2
TOP: Unit Circle

606 ANS: 1 PTS: 2 REF: 011815aii NAT: F.TF.A.2
TOP: Unit Circle

607 ANS:

$$t^2 + \left(\frac{4}{7}\right)^2 = 1 \qquad -\frac{\sqrt{33}}{7}$$

$$t^2 + \frac{16}{49} = \frac{49}{49}$$

$$t^2 = \frac{33}{49}$$

$$t = \frac{\pm\sqrt{33}}{7}$$

PTS: 2 REF: 011931aii NAT: F.TF.A.2 TOP: Unit Circle

608 ANS:

$\csc\theta = \dfrac{1}{\sin\theta}$, and $\sin\theta$ on a unit circle represents the y value of a point on the unit circle. Since $y = \sin\theta$, $\csc\theta = \dfrac{1}{y}$.

PTS: 2 REF: 011727aii NAT: F.TF.A.2 TOP: Reciprocal Trigonometric Relationships

609 ANS:

$\pi < \theta < 2\pi \rightarrow$ Quadrant III or IV θ must be in Quadrant IV, where $\tan\theta$ is negative.

$\cos\theta = \dfrac{\sqrt{3}}{4} \rightarrow$ Quadrant I or IV

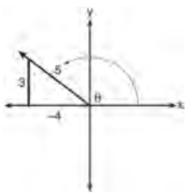
PTS: 2 REF: 012332aii NAT: F.TF.A.2 TOP: Finding the Terminal Side of an Angle

610 ANS: 4 PTS: 2 REF: 081707aii NAT: F.TF.A.2
TOP: Reference Angles KEY: bimodalgraph

611 ANS: 4 PTS: 2 REF: 012501aii NAT: F.TF.A.2
TOP: Determining Trigonometric Functions KEY: radians

612 ANS: 1

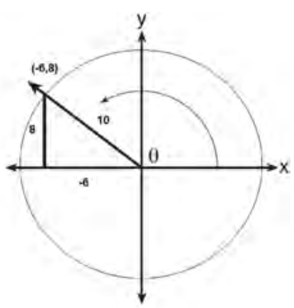
A reference triangle can be sketched using the coordinates $(-4,3)$ in the second quadrant to find the value of $\sin\theta$.



PTS: 2 REF: spr1503aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: extension to reals

613 ANS: 1

$\cos\theta = -\dfrac{6}{10} = -\dfrac{3}{5}$



PTS: 2 REF: 061617aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: extension to reals

614 ANS: 2

$$\sqrt{(-2)^2+(-3)^2} = \sqrt{13};\ \tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{-3}{\sqrt{13}}}{\frac{-2}{\sqrt{13}}} = \frac{3}{2}$$

PTS: 2 REF: 062304aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: extension to reals

615 ANS: 4

Since the terminal side of θ passes through $(-3,-4)$, $\cos\theta < 0$ and $\sin\theta < 0$. $\cos\theta < 0 \rightarrow \sec\theta < 0$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \rightarrow \frac{-}{-} = +$$

PTS: 2 REF: 082420aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: extension to reals

616 ANS:

$$\frac{-1}{\sqrt{2^2+(-1)^2}} = -\frac{1}{\sqrt{5}}$$

PTS: 2 REF: 061832aii NAT: F.TF.A.2 TOP: Determining Trigonometric Functions
KEY: extension to reals

617 ANS: 2

If $\cos\theta = \frac{7}{25}$, $\sin\theta = \pm\frac{24}{25}$, and $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{-\frac{24}{25}}{\frac{7}{25}} = -\frac{24}{7}$

PTS: 2 REF: 081811aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

618 ANS: 1

If $\sin\theta = \frac{7}{25}$, $\cos\theta = -\frac{24}{25}$ in QII, and $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{7}{25}}{\frac{-24}{25}} = -\frac{7}{24}$

PTS: 2 REF: 062417aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

619 ANS: 1

$$-\sqrt{1-\left(-\frac{3}{4}\right)^2} = -\sqrt{\frac{16}{16}-\frac{9}{16}} = -\sqrt{\frac{7}{16}} = -\frac{\sqrt{7}}{4}$$

PTS: 2 REF: 081905aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

620 ANS: 2

$$\cos\theta = \pm\sqrt{1-\left(\frac{-\sqrt{2}}{5}\right)^2} = \pm\sqrt{\frac{25}{25}-\frac{2}{25}} = \pm\frac{\sqrt{23}}{5}$$

PTS: 2 REF: 061712aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

621 ANS: 3

$$\sin^2 A+\left(\frac{\sqrt{5}}{3}\right)^2 = 1 \qquad \text{Since } \tan A < 0,\ \sin A = -\frac{2}{3}$$

$$\sin^2 A+\frac{5}{9} = \frac{9}{9}$$

$$\sin^2 A = \frac{4}{9}$$

$$\sin A = \pm\frac{2}{3}$$

PTS: 2 REF: 012320aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

622 ANS: 3

$$\frac{-2}{\sqrt{5^2-2^2}} = \frac{-2}{\sqrt{21}}$$

PTS: 2 REF: 082312aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

623 ANS: 1

$$\cos\theta = -\frac{3}{5};\ \sec\theta = -\frac{5}{3}$$

PTS: 2 REF: 012421aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

624 ANS:

$$\sin^2\theta+(-0.7)^2 = 1 \qquad \text{Since } \theta \text{ is in Quadrant II, } \sin\theta = \sqrt{.51} \text{ and } \tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\sqrt{.51}}{-0.7} \approx -1.02$$

$$\sin^2\theta = .51$$

$$\sin\theta = \pm\sqrt{.51}$$

PTS: 2 REF: 081628aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

625 ANS:

$\left(-\frac{2}{7}\right)^2 + \sin^2\theta = 1$ $\frac{3\sqrt{5}}{7}$ as sin is positive in Quadrant II.

$$\frac{4}{49} + \sin^2\theta = \frac{49}{49}$$

$$\sin^2\theta = \frac{45}{49}$$

$$\sin\theta = \pm\frac{3\sqrt{5}}{7}$$

PTS: 2 REF: 012527aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

626 ANS:

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{-7/25}{-24/25}$ $\cos\theta = \frac{-24}{25}$

PTS: 2 REF: 061928aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

627 ANS:

$$\cos A = \frac{\cos A}{\sin A}$$

$$-3 = \frac{\frac{3}{\sqrt{10}}}{\sin A}$$

$$\sin A = \frac{3}{-3\sqrt{10}} = -\frac{1}{\sqrt{10}}$$

PTS: 2 REF: 082229aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

628 ANS: 1 PTS: 2 REF: 011704aii NAT: F.TF.C.8
TOP: Proving Trigonometric Identities KEY: basic

629 ANS: 1

$-4(-1) - 3 = 1$ $8 = \frac{2\pi}{b}$

$$b = \frac{\pi}{4}$$

PTS: 2 REF: 081820aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

630 ANS: 4

$$\text{period} = \frac{2\pi}{B}$$

$$\frac{1}{60} = \frac{2\pi}{B}$$

$$B = 120\pi$$

PTS: 2 REF: 061624aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

631 ANS: 1 PTS: 2 REF: 061708aii NAT: F.TF.B.5
TOP: Modeling Trigonometric Functions

632 ANS: 1

The cosine function has been translated +3. Since the maximum is 5 and the minimum is 1, the amplitude is 2.

$$\frac{\pi}{3} = \frac{2\pi}{b}.$$

$$b = 6$$

PTS: 2 REF: 011913aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

633 ANS: 2

$$1 = \frac{2\pi}{k}$$

$$k = 2\pi$$

PTS: 2 REF: 012313aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

Algebra II Regents Exam Questions by State Standard: Topic
Answer Section

634 ANS: 1

$\text{amplitude} = \frac{8-2}{2} = 3,\ b = \frac{2\pi}{6} = \frac{\pi}{3},\ c = \frac{8+2}{2} = 5$

PTS: 2 REF: 062403aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

635 ANS: 4

$a = \frac{14-4}{2} = 5,\ d = \frac{14+4}{2} = 9$

PTS: 2 REF: 061810aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

636 ANS: 2 PTS: 2 REF: 011701aii NAT: F.IF.B.4
TOP: Graphing Trigonometric Functions

637 ANS: 4 PTS: 2 REF: 061706aii NAT: F.IF.B.4
TOP: Graphing Trigonometric Functions

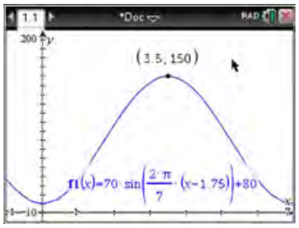
638 ANS: 3

$T(19) = 8\sin(0.3(19) - 3) + 74 \approx 77$

PTS: 2 REF: 061922aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

639 ANS: 2 PTS: 2 REF: 011804aii NAT: F.IF.B.4
TOP: Graphing Trigonometric Functions

640 ANS: 3



$H(t)$ is at a minimum at $70(-1) + 80 = 10$

PTS: 2 REF: 061613aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
KEY: maximum/minimum

641 ANS: 2

$-23(1) + 56 = 33;\ \ -23(-1) + 56 = 79$

PTS: 2 REF: 062305aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

642 ANS: 4 PTS: 2 REF: 012016aii NAT: F.IF.B.4
TOP: Graphing Trigonometric Functions KEY: increasing/decreasing

643 ANS: 2 PTS: 2 REF: 081610aii NAT: F.IF.B.4
TOP: Graphing Trigonometric Functions KEY: increasing/decreasing

644 ANS: 4 PTS: 2 REF: 082220aii NAT: F.IF.B.4
TOP: Graphing Trigonometric Functions

645 ANS: 3 PTS: 2 REF: 081705aii NAT: F.IF.B.4
TOP: Graphing Trigonometric Functions KEY: increasing/decreasing

646 ANS: 4
1) $d(2)=2$; 2) $d(1)=12$; 3) $d(9)\approx 11$; 4) $d(-1)=2$

PTS: 2 REF: 062220aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

647 ANS: 4

	Bar Harbor	**Phoenix**
Minimum	31.386	66.491
Midline	55.3	86.729
Maximum	79.214	106.967
Range	47.828	40.476

PTS: 2 REF: 061715aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions
KEY: maximum/minimum

648 ANS:
$2(-1)+5=3$

PTS: 2 REF: 082429aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

649 ANS:
$250(1)+2450=2700$ The maximum lung capacity of a person is 2700 mL.

PTS: 2 REF: 081928aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

650 ANS:
$\frac{h(2)-h(1)}{2-1}=-12$, $h(t)=0$ at $t\approx 2.2, 3.8$, using a graphing calculator to find where $h(t)=0$.

PTS: 4 REF: 061836aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

651 ANS: 4 PTS: 2 REF: 081718aii NAT: F.IF.C.7
TOP: Graphing Trigonometric Functions KEY: amplitude

652 ANS: 2 PTS: 2 REF: 082203aii NAT: F.IF.C.7
TOP: Graphing Trigonometric Functions KEY: amplitude

653 ANS:
$\frac{10.1--2}{2}-\frac{2.5--0.1}{2}=6.05-1.3=4.75$

PTS: 2 REF: 081930aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: amplitude

654 ANS: 1
$$\frac{2\pi}{b}=12$$
$$12b=2\pi$$
$$b=\frac{\pi}{6}$$

PTS: 2 REF: 012520aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

655 ANS: 2

$$P = \frac{2\pi}{\frac{\pi}{45}} = 90$$

PTS: 2 REF: 081822aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

656 ANS: 1

$$P = \frac{2\pi}{\frac{2\pi}{3}} = 3$$

PTS: 2 REF: 082413aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

657 ANS:

$\frac{2\pi}{\frac{2\pi}{5}} = 5$ The wheel rotates every 5 minutes.

PTS: 2 REF: 062429aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

658 ANS:

period is $\frac{2}{3}$. The wheel rotates once every $\frac{2}{3}$ second.

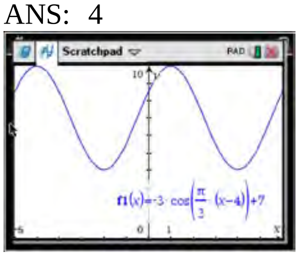
PTS: 2 REF: 061728aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

659 ANS:

Light wave C. The periods for A, B, and C are 280, 220 and 320.

PTS: 2 REF: 012030aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: period

660 ANS: 4



As the range is [4,10], the midline is $y = \frac{4+10}{2} = 7$.

PTS: 2 REF: fall1506aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: mixed

661 ANS: 1

The time of the next high tide will be the midpoint of consecutive low tides.

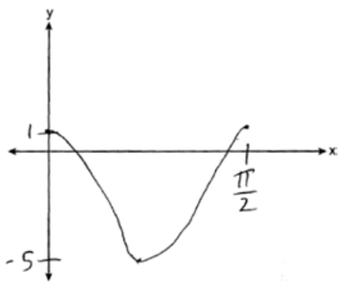
PTS: 2 REF: 011907aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: mixed

662 ANS: 4 PTS: 2 REF: 081912aii NAT: F.IF.C.7
TOP: Graphing Trigonometric Functions KEY: mixed

663 ANS:
Amplitude, because the height of the graph shows the volume of the air.

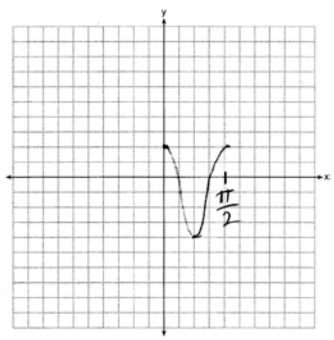
PTS: 2 REF: 081625aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: mixed

664 ANS:



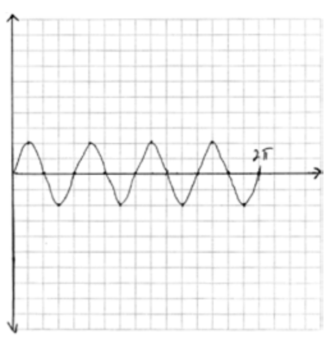
PTS: 2 REF: 082328aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

665 ANS:



PTS: 2 REF: 061628aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

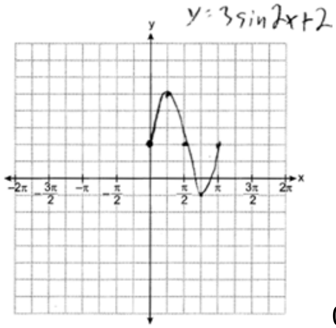
666 ANS:



$y = 2\sin 4x$

PTS: 4 REF: 081934aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

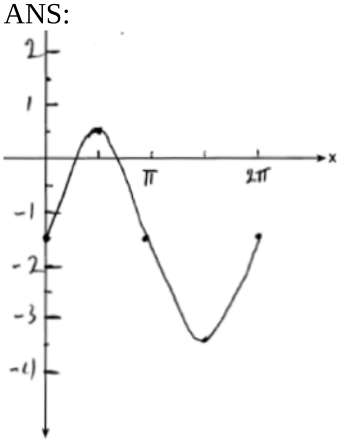
667 ANS:



$0 < x < \frac{\pi}{4}$

PTS: 4 REF: 012436aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

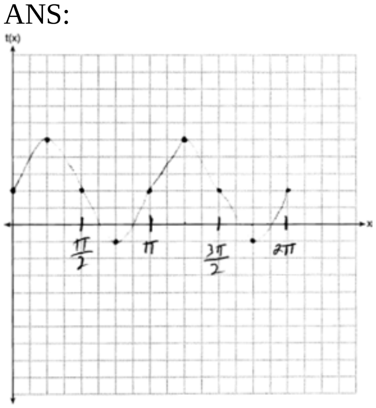
668 ANS:



Part a sketch is shifted $\frac{\pi}{3}$ units right.

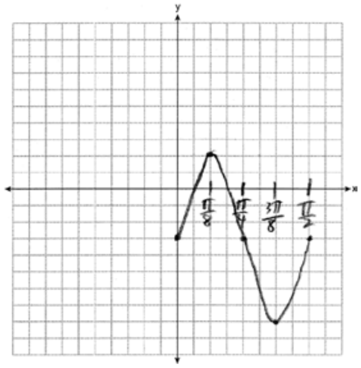
PTS: 4 REF: 081735aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

669 ANS:



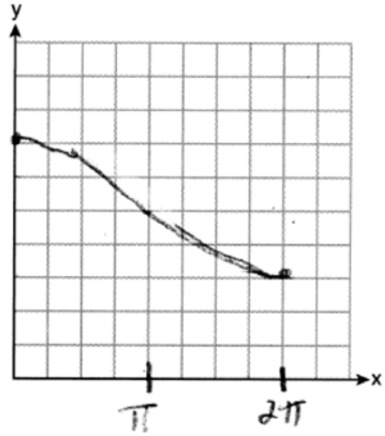
PTS: 2 REF: 081830aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

670 ANS:



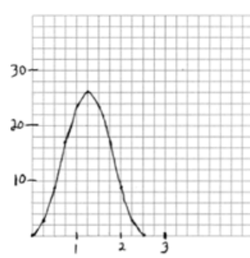
PTS: 2 REF: 012529aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

671 ANS:



PTS: 2 REF: 062231aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

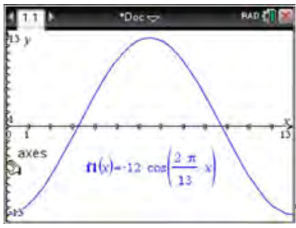
672 ANS:

period $= \dfrac{2\pi}{0.8\pi} = 2.5$. The wheel rotates once every 2.5 seconds. 

No, because the maximum of $f(t) = 26$.

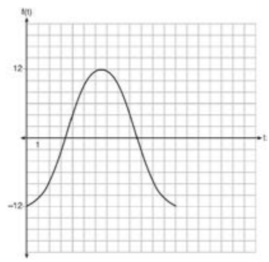
PTS: 6 REF: 061937aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

673 ANS:



The amplitude, 12, can be interpreted from the situation, since the water level has a minimum of –12 and a maximum of 12. The value of A is –12 since at 8:30 it is low tide. The period of the function is 13 hours, and is expressed in the function through the parameter B. By experimentation with technology or using the relation $P = \dfrac{2\pi}{B}$ (where P is the period), it is determined that $B = \dfrac{2\pi}{13}$.

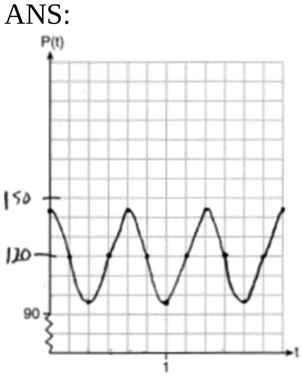
$$f(t) = -12\cos\left(\frac{2\pi}{13}t\right)$$



In order to answer the question about when to fish, the student must interpret the function and determine which choice, 7:30 pm or 10:30 pm, is on an increasing interval. Since the function is increasing from $t = 13$ to $t = 19.5$ (which corresponds to 9:30 pm to 4:00 am), 10:30 is the appropriate choice.

PTS: 6 REF: spr1514aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

674 ANS:



The period of P is $\frac{2}{3}$, which means the patient's blood pressure reaches a high every $\frac{2}{3}$ second and a low every $\frac{2}{3}$ second. The patient's blood pressure is high because 144 over 96 is greater than 120 over 80.

PTS: 6 REF: 011837aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: graph

675 ANS: 3

(3) repeats 3 times over 2π.

PTS: 2 REF: 011722aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions
KEY: recognize | bimodalgraph

676 ANS: 4
$4(x^2 - 6x + 9) + 4(y^2 + 18y + 81) = 76 + 36 + 324$

$$4(x-3)^2 + 4(y+9)^2 = 436$$

PTS: 2 REF: 061619aii NAT: G.GPE.A.1 TOP: Equations of Circles
KEY: completing the square

677 ANS: 4
$0.48 \cdot 0.25 = 0.12$

PTS: 1 REF: 061811aii NAT: S.CP.A.2 TOP: Probability of Compound Events

678 ANS: 2
(1) $0.4 \cdot 0.3 \neq 0.2$, (2) $0.8 \cdot 0.25 = 0.2$, (3) $P(A|B) = P(A) = 0.2$, (4) $0.2 \neq 0.15 \cdot 0.05$

$$0.2 \neq 0.2 \cdot 0.2$$

PTS: 2 REF: 011912aii NAT: S.CP.A.2 TOP: Probability of Compound Events

679 ANS:
$\frac{1}{3} \times \frac{5}{12} = \frac{5}{36}$

PTS: 2 REF: 012327aii NAT: S.CP.A.2 TOP: Probability of Compound Events

680 ANS: 2
$40 - (20 + 22 - 15) = 13$

PTS: 2 REF: 062204aii NAT: S.CP.B.7 TOP: Addition Rule

681 ANS: 4
$45\% + 31\% - 58\% = 18\%$

PTS: 2 REF: 082307aii NAT: S.CP.B.7 TOP: Addition Rule

682 ANS: 3
$\frac{1}{3} + \frac{1}{7} - \frac{9}{21} = \frac{7}{21} + \frac{3}{21} - \frac{9}{21} = \frac{1}{21}$

PTS: 2 REF: 082410aii NAT: S.CP.B.7 TOP: Addition Rule

683 ANS:
$P(S \cap M) = P(S) + P(M) - P(S \cup M) = \frac{649}{1376} + \frac{433}{1376} - \frac{974}{1376} = \frac{108}{1376}$

PTS: 2 REF: 061629aii NAT: S.CP.B.7 TOP: Addition Rule

684 ANS:
$\frac{165 + 66 - 33}{825} = \frac{198}{825}$

PTS: 2 REF: 081925aii NAT: S.CP.B.7 TOP: Addition Rule

685 ANS:
$.74 \cdot .24 = .1776$ $.74 + .24 - .1776 = .8024$

PTS: 4 REF: 012533aii NAT: S.CP.B.7 TOP: Addition Rule

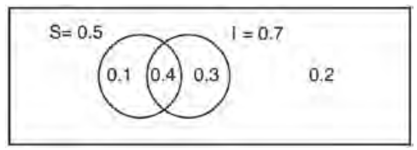
686 ANS:
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ A and B are independent since $P(A \cap B) = P(A) \cdot P(B)$

$0.8 = 0.6 + 0.5 - P(A \cap B)$ $\qquad 0.3 = 0.6 \cdot 0.5$

$P(A \cap B) = 0.3$ $\qquad 0.3 = 0.3$

PTS: 2 REF: 081632aii NAT: S.CP.B.7 TOP: Addition Rule

687 ANS:

This scenario can be modeled with a Venn Diagram: 

Since $P(S \cup I)_c = 0.2$, $P(S \cup I) = 0.8$. Then, $P(S \cap I) = P(S) + P(I) - P(S \cup I)$ If S and I are independent, then the

$= 0.5 + 0.7 - 0.8$

$= 0.4$

Product Rule must be satisfied. However, $(0.5)(0.7) \neq 0.4$. Therefore, salary and insurance have not been treated independently.

PTS: 4 REF: spr1513aii NAT: S.CP.B.7 TOP: Addition Rule

688 ANS:

$\frac{47}{108} = \frac{1}{4} + \frac{116}{459} - P(M \text{ and } J)$; No, because $\frac{31}{459} \neq \frac{1}{4} \cdot \frac{116}{459}$

$P(M \text{ and } J) = \frac{31}{459}$

PTS: 4 REF: 011834aii NAT: S.CP.B.7 TOP: Addition Rule

689 ANS: 4 PTS: 2 REF: 012008aii NAT: S.CP.A.3
TOP: Conditional Probability

690 ANS: 2
$P(B) \cdot P(A|B) = P(A \text{ and } B)$

$P(B) \cdot 0.8 = 0.2$

$P(B) = 0.25$

PTS: 2 REF: 081913aii NAT: S.CP.A.3 TOP: Conditional Probability

691 ANS: 4 PTS: 2 REF: 081824aii NAT: S.CP.A.3
TOP: Conditional Probability

692 ANS: 2
$\frac{85}{210 + 85}$

PTS: 2 REF: 081818aii NAT: S.CP.A.3 TOP: Conditional Probability

693 ANS: 4

$P(B)\cdot P(P|B)=P(P \text{ and } B)$

$.68\cdot P(P|B)=.49$

$P(P|B)=.72$

PTS: 2 REF: 062416aii NAT: S.CP.A.3 TOP: Conditional Probability

694 ANS: 1

The probability of rain equals the probability of rain, given that Sean pitches.

PTS: 2 REF: 061611aii NAT: S.CP.A.3 TOP: Conditional Probability

695 ANS: 2

The events are independent because $P(A \text{ and } B)=P(A)\cdot P(B)$.

$$0.125=0.5\cdot 0.25$$

If $P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)=0.25+0.5-.125=0.625$, then the events are not mutually exclusive because $P(A \text{ or } B)=P(A)+P(B)$

$0.625\ne 0.5+0.25$

PTS: 2 REF: 061714aii NAT: S.CP.A.3 TOP: Conditional Probability

696 ANS:

$P(W/D)=\dfrac{P(W\wedge D)}{P(D)}=\dfrac{.4}{.5}=.8$

PTS: 2 REF: 081726aii NAT: S.CP.A.3 TOP: Conditional Probability

697 ANS:

$P(A+B)=P(A)\cdot P(B|A)=0.8\cdot 0.85=0.68$

PTS: 2 REF: 011928aii NAT: S.CP.A.3 TOP: Conditional Probability

698 ANS:

$P(P/K)=\dfrac{P(P\wedge K)}{P(K)}=\dfrac{1.9}{2.3}\approx 82.6\%$ A key club member has an 82.6% probability of being enrolled in AP Physics.

PTS: 4 REF: 011735aii NAT: S.CP.A.3 TOP: Conditional Probability

699 ANS: 4

$\dfrac{13}{13+11}=\dfrac{13}{24}$

PTS: 2 REF: 012011aii NAT: S.CP.A.4 TOP: Conditional Probability

700 ANS: 1

$\dfrac{20}{14+20+6}=\dfrac{1}{2}$

PTS: 2 REF: 082303aii NAT: S.CP.A.4 TOP: Conditional Probability

701 ANS: 1

$$\frac{157}{25+47+157}$$

PTS: 2 REF: 081607aii NAT: S.CP.A.4 TOP: Conditional Probability

702 ANS: 1

The probability of being late given that a student walked is $\frac{4}{22}$. The probability that student walked given that the student was late is $\frac{4}{30}$.

PTS: 2 REF: 012518aii NAT: S.CP.A.4 TOP: Conditional Probability

703 ANS:

$$\frac{103}{110+103}=\frac{103}{213}$$

PTS: 2 REF: 061825aii NAT: S.CP.A.4 TOP: Conditional Probability

704 ANS:

A student is more likely to jog if both siblings jog. 1 jogs: $\frac{416}{2239}\approx 0.19$. both jog: $\frac{400}{1780}\approx 0.22$

PTS: 2 REF: 061732aii NAT: S.CP.A.4 TOP: Conditional Probability

705 ANS: 1

$$\frac{8+12}{120}\bullet\frac{8+40}{120}=\frac{8}{120}$$

$$\frac{1}{6}\bullet\frac{4}{10}=\frac{1}{15}$$

$$\frac{4}{60}=\frac{1}{15}$$

PTS: 2 REF: 082422aii NAT: S.CP.A.4 TOP: Conditional Probability

706 ANS:

No, because $P(M/R)\neq P(M)$

$$\frac{70}{180}\neq\frac{230}{490}$$

$$0.38\neq 0.47$$

PTS: 2 REF: 011731aii NAT: S.CP.A.4 TOP: Conditional Probability

707 ANS:

$P(F|L)=\frac{12}{27}$ $P(F)=\frac{22}{45}$ Since $P(F|L)\neq P(F)$, the events are not independent.

PTS: 4 REF: 061936aii NAT: S.CP.A.4 TOP: Conditional Probability

708 ANS:
Yes. $P(\text{Bl}) = P(\text{Bl}|\text{Gl})$

$$0.14 + 0.26 = \frac{.14}{.35}$$

$$.4 = .4$$

PTS: 2 REF: 062229aii NAT: S.CP.A.4 TOP: Conditional Probability

709 ANS:

Based on these data, the two events do not appear to be independent. $P(J) = \frac{145}{277} = 0.52$, while $P(J\,|\,D) = \frac{58}{139} = 0.42$. The probability of being a junior is not the same as the conditional probability of being a junior, given the junior drives to school.

PTS: 2 REF: 062431aii NAT: S.CP.A.4 TOP: Conditional Probability

710 ANS:
No, because $P(F\,/\,CR) \neq P(F)$

$$\frac{36}{42+36} \neq \frac{17+37+36+15}{39+17+42+12+17+37+36+15}$$

$$\frac{36}{78} \neq \frac{105}{215}$$

$$\frac{6}{13} \neq \frac{21}{43}$$

PTS: 2 REF: 082231aii NAT: S.CP.A.4 TOP: Conditional Probability

711 ANS:

Based on these data, the two events do not appear to be independent. $P(F) = \frac{106}{200} = 0.53$, while $P(F\,|\,T) = \frac{54}{90} = 0.6$, $P(F\,|\,R) = \frac{25}{65} = 0.39$, and $P(F\,|\,C) = \frac{27}{45} = 0.6$. The probability of being female are not the same as the conditional probabilities. This suggests that the events are not independent.

PTS: 2 REF: fall1508aii NAT: S.CP.A.4 TOP: Conditional Probability

712 ANS:
$\frac{1200}{1200+2016} \approx .373$. Yes, because $\frac{1600}{4288} \approx .373$ also.

PTS: 4 REF: 062334aii NAT: S.CP.A.4 TOP: Conditional Probability

713 ANS:
$\frac{3+42}{1500} = 3\%$ $\frac{3}{3+12} = 20\%$ No, because a person is more likely to be allergic milk if he is also allergic to nuts.

PTS: 4 REF: 012433aii NAT: S.CP.A.4 TOP: Conditional Probability

714 ANS: 3 PTS: 2 REF: 061607aii NAT: S.IC.A.2
TOP: Analysis of Data

715 ANS: 2 PTS: 2 REF: 011820aii NAT: S.IC.A.2
TOP: Analysis of Data

716 ANS: 3 PTS: 2 REF: 061710aii NAT: S.IC.A.2
TOP: Analysis of Data

717 ANS:
No. $0.499 \pm 2(0.049) \to 0.401 - 0.597$. Since 0.43 falls within this interval, Robin's coin is likely not unfair.

PTS: 2 REF: 061932aii NAT: S.IC.A.2 TOP: Analysis of Data

718 ANS:
Yes. Using a 95% confidence interval, values outside the interval $3.95 - 4.05$ are unusual.

PTS: 2 REF: 012532aii NAT: S.IC.A.2 TOP: Analysis of Data

719 ANS:
$\frac{1}{10}, \frac{1}{5}$, and no, since 0.10 clearly falls within 95% of 0.20.

PTS: 4 REF: 012334aii NAT: S.IC.A.2 TOP: Analysis of Data

720 ANS:
$2(0.042) = 0.084 \approx 0.08$ The percent of users making in-app purchases will be within 8% of 35%.

PTS: 2 REF: 081832aii NAT: S.IC.A.2 TOP: Analysis of Data

721 ANS:
Yes. The margin of error from this simulation indicates that 95% of the observations fall within $\pm$ 0.12 of the simulated proportion, 0.25. The margin of error can be estimated by multiplying the standard deviation, shown to be 0.06 in the dotplot, by 2, or applying the estimated standard error formula, $\left(\sqrt{\frac{p(1-p)}{n}}\right)$ *or* $\left(\sqrt{\frac{(0.25)(0.75)}{50}}\right)$ and multiplying by 2. The interval 0.25 ± 0.12 includes plausible values for the true proportion of people who prefer Stephen's new product. The company has evidence that the population proportion could be at least 25%. As seen in the dotplot, it can be expected to obtain a sample proportion of 0.18 (9 out of 50) or less several times, even when the population proportion is 0.25, due to sampling variability. Given this information, the results of the survey do not provide enough evidence to suggest that the true proportion is not at least 0.25, so the development of the product should continue at this time.

PTS: 4 REF: spr1512aii NAT: S.IC.A.2 TOP: Analysis of Data

722 ANS:
$138.905 \pm 2 \cdot 7.95 = 123 - 155$. No, since 125 (50% of 250) falls within the 95% interval.

PTS: 4 REF: 011835aii NAT: S.IC.A.2 TOP: Analysis of Data

723 ANS:
$.651 \pm 2 \cdot .034 = .58 - .72$. No, since .61 (122/200) falls within the 95% interval.

PTS: 4 REF: 062235aii NAT: S.IC.A.2 TOP: Analysis of Data

724 ANS:
$.819 \pm 2 \cdot .053 = .713 - .925$. Since .70 does not fall within the 95% interval.

PTS: 4 REF: 082236aii NAT: S.IC.A.2 TOP: Analysis of Data

725 ANS:
No. $0.852 \pm 2(0.029) \rightarrow 0.794 - 0.91$. 0.88 falls within this interval.

PTS: 2 REF: 062332aii NAT: S.IC.A.2 TOP: Analysis of Data

726 ANS:
$.795 \pm 2 \cdot .085 = .625 - .965$. Yes, as it is plausible at least .625 of the customers will purchase both.

PTS: 4 REF: 062435aii NAT: S.IC.A.2 TOP: Analysis of Data

727 ANS:
$42.029 \pm 2 \cdot 3.105 \approx 35.82 - 48.24$. Yes, since 49.8 falls outside the 95% interval.

PTS: 4 REF: 082434aii NAT: S.IC.A.2 TOP: Analysis of Data

728 ANS:
$29.101 \pm 2 \cdot 0.934 = 27.23 - 30.97$. Yes, since 30 falls within the 95% interval.

PTS: 4 REF: 011935aii NAT: S.IC.A.2 TOP: Analysis of Data

729 ANS:
Since there are six flavors, each flavor can be assigned a number, 1-6. Use the simulation to see the number of times the same number is rolled 4 times in a row.

PTS: 2 REF: 081728aii NAT: S.IC.A.2 TOP: Analysis of Data

730 ANS: 3 PTS: 2 REF: 012015aii NAT: S.IC.B.3
TOP: Analysis of Data

731 ANS: 1 PTS: 2 REF: 012502aii NAT: S.IC.B.3
TOP: Analysis of Data

732 ANS: 2 PTS: 2 REF: 081802aii NAT: S.IC.B.3
TOP: Analysis of Data

733 ANS: 3 PTS: 2 REF: 061901aii NAT: S.IC.B.3
TOP: Analysis of Data

734 ANS: 4 PTS: 2 REF: 081906aii NAT: S.IC.B.3
TOP: Analysis of Data

735 ANS: 4 PTS: 2 REF: 062216aii NAT: S.IC.B.3
TOP: Analysis of Data

736 ANS: 3 PTS: 2 REF: 082401aii NAT: S.IC.B.3
TOP: Analysis of Data

737 ANS: 2 PTS: 2 REF: 082204aii NAT: S.IC.B.3
TOP: Analysis of Data

738 ANS: 3 PTS: 2 REF: 012401aii NAT: S.IC.B.3
TOP: Analysis of Data

739 ANS: 2 PTS: 2 REF: 081717aii NAT: S.IC.B.3
TOP: Analysis of Data

740 ANS: 4 PTS: 2 REF: 012314aii NAT: S.IC.B.3
TOP: Analysis of Data

741 ANS: 3 PTS: 2 REF: 011706aii NAT: S.IC.B.3
TOP: Analysis of Data

742 ANS: 3

between 000 and 449, inclusive$\rightarrow \frac{450}{1000} = 45\%$

PTS: 2 REF: 012024aii NAT: S.IC.B.3 TOP: Analysis of Data

743 ANS: 1 PTS: 2 REF: 012506aii NAT: S.IC.B.3
TOP: Analysis of Data

744 ANS:

Randomly assign participants to two groups. One group uses the toothpaste with ingredient *X* and the other group uses the toothpaste without ingredient *X*.

PTS: 2 REF: 061626aii NAT: S.IC.B.3 TOP: Analysis of Data

745 ANS: 4

$2 \times 0.035 = 0.07$

PTS: 2 REF: 012319aii NAT: S.IC.B.4 TOP: Analysis of Data

746 ANS: 2

$$ME = \left(z\sqrt{\frac{p(1-p)}{n}} \right) = \left(1.96\sqrt{\frac{(0.55)(0.45)}{900}} \right) \approx 0.03 \text{ or } \frac{1}{\sqrt{900}} \approx 0.03$$

PTS: 2 REF: 081612aii NAT: S.IC.B.4 TOP: Analysis of Data

747 ANS: 2

$$\frac{212}{1334} \approx .16 \quad ME = \left(z\sqrt{\frac{p(1-p)}{n}} \right) = \left(1.96\sqrt{\frac{(0.16)(0.84)}{1334}} \right) \approx 0.02 \text{ or } \frac{1}{\sqrt{1334}} \approx .027$$

PTS: 2 REF: 081716aii NAT: S.IC.B.4 TOP: Analysis of Data

748 ANS: 2

$.43 \pm 2(0.05)$ contains about 95% of the data.

PTS: 2 REF: 062317aii NAT: S.IC.B.4 TOP: Analysis of Data

749 ANS: 2

$0.254 \pm 2(0.060) \rightarrow (0.134, 0.374)$

PTS: 2 REF: 061913aii NAT: S.IC.B.5 TOP: Analysis of Data

750 ANS: 4 PTS: 2 REF: 012014aii NAT: S.IC.B.5
TOP: Analysis of Data

751 ANS: 2 PTS: 2 REF: 011709aii NAT: S.IC.B.5
TOP: Analysis of Data

752 ANS:

$0.301 \pm 2(0.058) \rightarrow 0.185 - 0.417 \quad \frac{14}{60} \approx 0.23$. It is not unusual because 0.23 falls within this interval.

PTS: 4 REF: 081935aii NAT: S.IC.B.5 TOP: Analysis of Data

753 ANS:
The mean difference between the students' final grades in group 1 and group 2 is –3.64. This value indicates that students who met with a tutor had a mean final grade of 3.64 points less than students who used an on-line subscription. One can infer whether this difference is due to the differences in intervention or due to which students were assigned to each group by using a simulation to rerandomize the students' final grades many (500) times. If the observed difference –3.64 is the result of the assignment of students to groups alone, then a difference of –3.64 or less should be observed fairly regularly in the simulation output. However, a difference of –3 or less occurs in only about 2% of the rerandomizations. Therefore, it is quite unlikely that the assignment to groups alone accounts for the difference; rather, it is likely that the difference between the interventions themselves accounts for the difference between the two groups' mean final grades.

PTS: 4 REF: fall1514aii NAT: S.IC.B.5 TOP: Analysis of Data

754 ANS:
$0.01 \pm 2 \cdot 0.38 = -0.75 - 0.77$. No, since 0.6 falls within the 95% interval.

PTS: 4 REF: 082336aii NAT: S.IC.B.5 TOP: Analysis of Data

755 ANS:
$0.602 \pm 2 \cdot 0.066 = 0.47 - 0.73$. Since 0.50 falls within the 95% interval, this supports the concern there may be an even split.

PTS: 4 REF: 061635aii NAT: S.IC.B.5 TOP: Analysis of Data

756 ANS:
$0.506 \pm 2 \cdot 0.078 = 0.35 - 0.66$. The 32.5% value falls below the 95% confidence level.

PTS: 4 REF: 061736aii NAT: S.IC.B.5 TOP: Analysis of Data

757 ANS:
Some of the students who did not drink energy drinks read faster than those who did drink energy drinks.
$17.7 - 19.1 = -1.4$ Differences of -1.4 and less occur $\frac{25}{232}$ or about 10% of the time, so the difference is not unusual.

PTS: 4 REF: 081636aii NAT: S.IC.B.5 TOP: Analysis of Data

758 ANS:
$23 - 18 = 5$, $\bar{x} \pm 2\sigma = -3.07 - 3.13$, Yes, a difference of 5 or more occurred three times out of a thousand, which is statistically significant.

PTS: 4 REF: 061834aii NAT: S.IC.B.5 TOP: Analysis of Data

759 ANS:
John found the means of the scores of the two rooms and subtracted the means. The mean score for the classical room was 7 higher than the rap room (82-75). Yes, there is less than a 5% chance this difference occurring due to random chance. It is likely the difference was due to the music.

PTS: 4 REF: 081836aii NAT: S.IC.B.5 TOP: Analysis of Data

760 ANS: 2
$9.82 \pm 2(1.4)$

PTS: 2 REF: 012411aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

761 ANS: 1 PTS: 2 REF: 081722aii NAT: S.IC.B.6
TOP: Analysis of Data KEY: draw conclusions

762 ANS: 3 PTS: 2 REF: 082201aii NAT: S.IC.B.6
TOP: Analysis of Data KEY: draw conclusions

763 ANS: 3 PTS: 2 REF: 012418aii NAT: S.IC.B.6
TOP: Analysis of Data KEY: draw conclusions

764 ANS:
About 38% $\left(\frac{475}{1250}\right)$ of high school juniors in the population will choose a four-year college.

PTS: 2 REF: 012432aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

765 ANS:
sample: pails of oranges; population: truckload of oranges. It is likely that about 5% of all the oranges are unsatisfactory.

PTS: 2 REF: 011726aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

766 ANS:
Using a 95% level of confidence, $x \pm 2$ standard deviations sets the usual wait time as 150-302 seconds. 360 seconds is unusual.

PTS: 2 REF: 081629aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: draw conclusions

767 ANS: 3
Self selection causes bias.

PTS: 2 REF: 061703aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

768 ANS: 4 PTS: 2 REF: 011801aii NAT: S.IC.B.6
TOP: Analysis of Data KEY: bias

769 ANS: 2 PTS: 2 REF: 011910aii NAT: S.IC.B.6
TOP: Analysis of Data KEY: bias

770 ANS: 3
To determine student opinion, survey the widest range of students.

PTS: 2 REF: 062202aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

771 ANS: 4 PTS: 2 REF: 082301aii NAT: S.IC.B.6
TOP: Analysis of Data KEY: bias

772 ANS: 1
II. Ninth graders drive to school less often; III.Students know little about adults; IV. Calculus students love math!

PTS: 2 REF: 081602aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

773 ANS:
Self selection is a cause of bias because people with more free time are more likely to respond.

PTS: 2 REF: 061828aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

774 ANS:
The opinion sought is that of the entire student body, but the first period computer science class may not be representative of the entire student body.

PTS: 2 REF: 062427aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

775 ANS:
Pick random names from a list of all students and ask each one his method.

PTS: 2 REF: 062325aii NAT: S.IC.B.6 TOP: Analysis of Data
KEY: bias

776 ANS: 3
$y = 40(1.2)^8 \approx 168$

PTS: 2 REF: 062406aii NAT: S.ID.B.6 TOP: Regression
KEY: exponential

777 ANS: 3
$y = 1.77(1.18)^x \quad y(41) \approx 1{,}850{,}950$

PTS: 2 REF: 062314aii NAT: S.ID.B.6 TOP: Regression
KEY: exponential

778 ANS:
$y = 2.459(1.616)^x$

PTS: 2 REF: 012329aii NAT: S.ID.B.6 TOP: Regression
KEY: exponential

779 ANS:
$D = 1.223(2.652)^A$

PTS: 2 REF: 011826aii NAT: S.ID.B.6 TOP: Regression
KEY: exponential

780 ANS:
$F(t) = 169.136(.971)^t$

PTS: 2 REF: 062232aii NAT: S.ID.B.6 TOP: Regression
KEY: exponential

781 ANS:

$y = 4.168(3.981)^x$.

$$100 = 4.168(3.981)^x$$

$$\log\frac{100}{4.168} = \log(3.981)^x$$

$$\log\frac{100}{4.168} = x\log(3.981)$$

$$\frac{\log\frac{100}{4.168}}{\log(3.981)} = x$$

$$x \approx 2.25$$

PTS: 4 REF: 081736aii NAT: S.ID.B.6 TOP: Regression
KEY: exponential

782 ANS:

$y = 101.523(.883)^x$ $29 = 101.523(.883)^x$

$$\frac{29}{101.523} = (.883)^x$$

$$\log\frac{29}{101.523} = x\log(.883)$$

$$\frac{\log\frac{29}{101.523}}{\log(.883)} = x$$

$$x \approx 10.07$$

PTS: 4 REF: 012036aii NAT: S.ID.B.6 TOP: Regression
KEY: exponential

783 ANS: 2 PTS: 2 REF: 061804aii NAT: S.ID.B.6
TOP: Regression KEY: choose model

784 ANS: 3

The pattern suggests an exponential pattern, not linear or sinusoidal. A 4% growth rate is accurate, while a 43% growth rate is not.

PTS: 2 REF: 011713aii NAT: S.ID.B.6 TOP: Regression
KEY: choose model

785 ANS: 1 PTS: 2 REF: 082406aii NAT: S.ID.B.6
TOP: Regression KEY: choose model

786 ANS: 2 PTS: 2 REF: 011901aii NAT: S.ID.A.4
TOP: Normal Distributions KEY: mean and standard deviation

787 ANS: 2

$\overline{x} + 2\sigma$ represents approximately 48% of the data.

PTS: 2 REF: 061609aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

788 ANS: 3

$\overline{x} + 2\sigma$ represents approximately 99.1% of the data.

PTS: 2 REF: 012514aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

789 ANS: 1
$84.1\% \times 750 \approx 631$

PTS: 2 REF: 011923aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict

790 ANS:

25

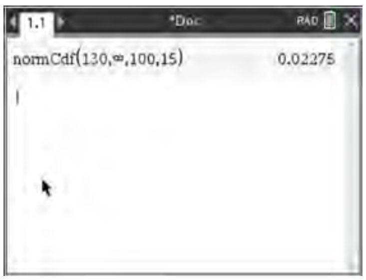
PTS: 2 REF: 012429aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

791 ANS: 2 PTS: 2 REF: 082313aii NAT: S.ID.A.4
TOP: Normal Distributions KEY: percent

792 ANS: 1

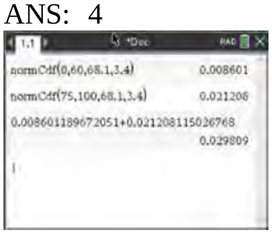
PTS: 2 REF: 081711aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

793 ANS: 1



PTS: 2 REF: 081919aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

794 ANS: 4



PTS: 2 REF: 062316aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

795 ANS:

69

PTS: 2 REF: 061726aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent

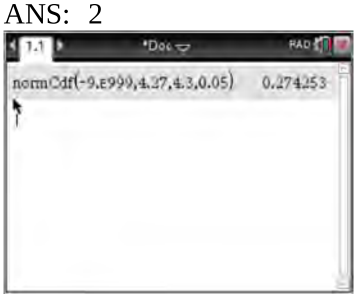
796 ANS:

PTS: 2 REF: 082428aii NAT: S.ID.A.4 TOP: Normal Distributions

797 ANS: 3

PTS: 2 REF: 081604aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: probability

798 ANS: 2



PTS: 2 REF: 061817aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: probability

799 ANS:

normcdf(510, 540, 480, 24) = 0.0994 $z = \frac{510-480}{24} = 1.25$ $1.25 = \frac{x-510}{20}$ $2.5 = \frac{x-510}{20}$ 535-560

$z = \frac{540-480}{24} = 2.5$ $x = 535$ $x = 560$

PTS: 4 REF: fall1516aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: probability

800 ANS: 4

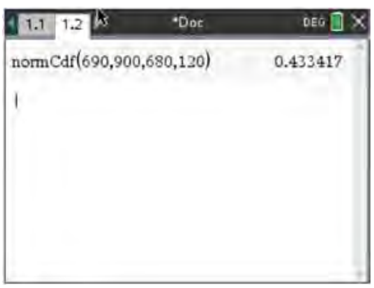
$496 \pm 2(115)$

PTS: 2 REF: 011718aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: interval

801 ANS: 3
$2.12 \pm 2(.05)$

PTS: 2 REF: 012509aii NAT: S.ID.A.4 TOP: Normal Distributions
802 ANS: 1 PTS: 2 REF: 062214aii NAT: S.ID.A.4
TOP: Normal Distributions KEY: predict
803 ANS: 3
$440 \times 2.3\% \approx 10$

PTS: 2 REF: 011807aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict
804 ANS: 4
$49 \times 16.7\% \approx 8$

PTS: 2 REF: 062418aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict
805 ANS:


43

PTS: 2 REF: 012328aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: percent
806 ANS: 4
$400 \cdot .954 \approx 380$

PTS: 2 REF: 061918aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict
807 ANS:
$1200 \cdot 0.784 \approx 941$

PTS: 2 REF: 081828aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict
808 ANS:
$0.133696 \times 9256 \approx 1237$

PTS: 2 REF: 082230aii NAT: S.ID.A.4 TOP: Normal Distributions
KEY: predict