ID: 005e9982

$$f(x) = 9{,}000(0.66)^x$$

The given function f models the number of advertisements a company sent to its clients each year, where x represents the number of years since 1997, and $0 \leq x \leq 5$. If $y = f(x)$ is graphed in the *xy*-plane, which of the following is the best interpretation of the *y*-intercept of the graph in this context?

A. The minimum estimated number of advertisements the company sent to its clients during the 5 years was $1{,}708$.

B. The minimum estimated number of advertisements the company sent to its clients during the 5 years was $9{,}000$.

C. The estimated number of advertisements the company sent to its clients in 1997 was $1{,}708$.

D. The estimated number of advertisements the company sent to its clients in 1997 was $9{,}000$.

ID: fe81a236

The function g is defined by $g(x) = x(x-2)(x+6)^2$. The value of $g(7-w)$ is 0, where w is a constant. What is the sum of all possible values of w?

ID: 54bf74ea

$$p(t) = 90{,}000(1.06)^t$$

The given function p models the population of Lowell t years after a census. Which of the following functions best models the population of Lowell m months after the census?

A. $r(m) = \frac{90{,}000}{12}(1.06)^m$

B. $r(m) = 90{,}000\left(\frac{1.06}{12}\right)^m$

C. $r(m) = 90{,}000\left(\frac{1.06}{12}\right)^{\frac{m}{12}}$

D. $r(m) = 90{,}000(1.06)^{\frac{m}{12}}$

ID: a51ff0d6

$$f(x) = (x + 7)^2 + 4$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

ID: 32dc74a4

A right rectangular prism has a height of 9 inches. The length of the prism's base is x inches, which is 7 inches more than the width of the prism's base. Which function V gives the volume of the prism, in cubic inches, in terms of the length of the prism's base?

A. $V(x) = x(x + 9)(x + 7)$

B. $V(x) = x(x + 9)(x - 7)$

C. $V(x) = 9x(x + 7)$

D. $V(x) = 9x(x - 7)$

ID: 1d670e5f

$$f(x) = x^2 - 48x + 2{,}304$$

What is the minimum value of the given function?

ID: 80803aed

The function g is defined by $g(x) = (x + 14)(t - x)$, where t is a constant. In the *xy*-plane, the graph of $y = g(x)$ passes through the point $(24, 0)$. What is the value of $g(0)$?

ID: e24f00be

The product of two positive integers is 462. If the first integer is 5 greater than twice the second integer, what is the smaller of the two integers?

ID: a2d5ec41

Two variables, x and y, are related such that for each increase of 1 in the value of x, the value of y increases by a factor of 4. When $x = 0$, $y = 200$. Which equation represents this relationship?

A. $y = 4$msup

B. $y = 4$msup

C. $y = 200$msup

D. $y = 200$msup

ID: 5ec80061

$$f(t) = 8{,}000(0.65)^t$$

The given function f models the number of coupons a company sent to their customers at the end of each year, where t represents the number of years since the end of 1998, and $0 \leq t \leq 5$. If $y = f(t)$ is graphed in the *ty*-plane, which of the following is the best interpretation of the *y*-intercept of the graph in this context?

A. The minimum estimated number of coupons the company sent to their customers during the 5 years was $1{,}428$.

B. The minimum estimated number of coupons the company sent to their customers during the 5 years was $8{,}000$.

C. The estimated number of coupons the company sent to their customers at the end of 1998 was $1{,}428$.

D. The estimated number of coupons the company sent to their customers at the end of 1998 was $8{,}000$.

ID: a6c47b9c

The function f is defined by $f(x) = (-8)(2)^x + 22$. What is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(0, 14)$

B. $(0, 2)$

C. $(0, 22)$

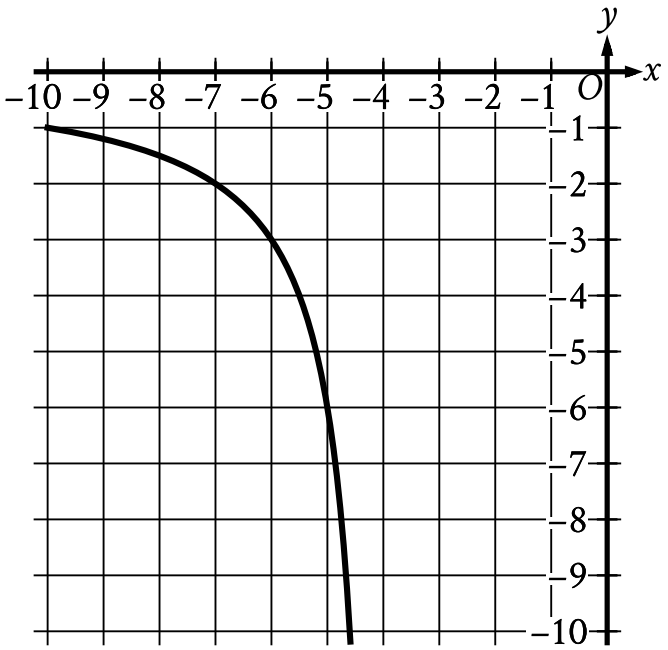
D. $(0, -8)$

ID: 1145bfcc

$$y = x^2 - 14x + 22$$

The given equation relates the variables x and y. For what value of x does the value of y reach its minimum?

ID: c7f7ccdd



The rational function f is defined by an equation in the form $f(x) = \frac{a}{x+b}$, where a and b are constants. The partial graph of $y = f(x)$ is shown. If $g(x) = f(x + 4)$, which equation could define function g?

A. $g(x) = \frac{6}{x}$

B. $g(x) = \frac{6}{x+4}$

C. $g(x) = \frac{6}{x+8}$

D. $g(x) = \frac{6(x+4)}{x+4}$

ID: 2833ad7d

A model estimates that at the end of each year from 2015 to 2020, the number of squirrels in a population was 150% more than the number of squirrels in the population at the end of the previous year. The model estimates that at the end of 2016, there were 180 squirrels in the population. Which of the following equations represents this model, where n is the estimated number of squirrels in the population t years after the end of 2015 and $t \leq 5$?

A. $n = 72$msup

B. $n = 72$msup

C. $n = 180$msup

D. $n = 180$msup

ID: 317d165b

$$f(x) = 9(4)^x$$

The function f is defined by the given equation. If $g(x) = f(x + 2)$, which of the following equations defines the function g?

A. $g(x) = 18(4)^x$

B. $g(x) = 144(4)^x$

C. $g(x) = 18(8)^x$

D. $g(x) = 81(16)^x$

ID: 2a093c45

$$f(x) = (x - 10)(x + 13)$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

A. -130

B. -13

C. $-\frac{23}{2}$

D. $-\frac{3}{2}$

ID: a4a86ebb

In the *xy*-plane, a parabola has vertex $(9, -14)$ and intersects the *x*-axis at two points. If the equation of the parabola is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants, which of the following could be the value of $a + b + c$?

A. -23

B. -19

C. -14

D. -12

ID: b91b2899

$$f(x) = (1.84)^{\frac{x}{4}}$$

The function f is defined by the given equation. The equation can be rewritten as $f(x) = \left(1 + \frac{p}{100}\right)^x$, where p is a constant. Which of the following is closest to the value of p?

A. 16

B. 21

C. 46

D. 96

ID: f5f840a0

For the function f, $f(0) = 86$, and for each increase in x by 1, the value of $f(x)$ decreases by 80%. What is the value of $f(2)$?

ID: 03d0309b

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

In the *xy*-plane, when the graph of the function f, where $y = f(x)$, is shifted up 6 units, the resulting graph is defined by the function g. If the graph of $y = g(x)$ crosses through the point $(4, b)$, where b is a constant, what is the value of b?

ID: 1caa83ee

For the function q, the value of $q(x)$ decreases by 45% for every increase in the value of x by 1. If $q(0) = 14$, which equation defines q?

A. $q(x) = 0.55(14)^x$

B. $q(x) = 1.45(14)^x$

C. $q(x) = 14(0.55)^x$

D. $q(x) = 14(1.45)^x$

ID: 6a8a7fbd

The function f is defined by $f(x) = a\sqrt{x + b}$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x)$ passes through the point $(-24, 0)$, and $f(24) < 0$. Which of the following must be true?

A. $f(0) = 24$

B. $f(0) = -24$

C. $a > b$

D. $a < b$

ID: 81aa6aa9

When the quadratic function f is graphed in the *xy*-plane, where $y = f(x)$, its vertex is $(-3, 6)$. One of the *x*-intercepts of this graph is $\left(-\frac{17}{4}, 0\right)$. What is the other *x*-intercept of the graph?

A. $\left(-\frac{29}{4}, 0\right)$

B. $\left(-\frac{7}{4}, 0\right)$

C. $\left(\frac{5}{4}, 0\right)$

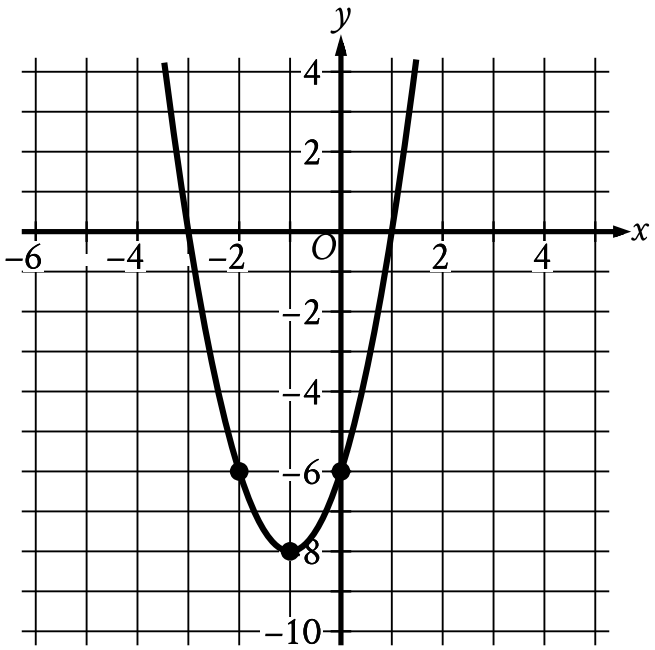
D. $\left(\frac{17}{4}, 0\right)$

ID: 3e4e3220

x	y
21	-8
23	8
25	-8

The table shows three values of x and their corresponding values of y, where $y = f(x) + 4$ and f is a quadratic function. What is the *y*-coordinate of the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

ID: a44eb7d8



The graph of $y = 2x^2 + bx + c$ is shown, where b and c are constants. What is the value of bc?

ID: f85886ff

A machine launches a softball from ground level. The softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds and hits the ground at 3.6 seconds. Which equation represents the height above ground h, in meters, of the softball t seconds after it is launched?

A. $h = -t^2 + 3.6$

B. $h = -t^2 + 51.84$

C. $h = -16\text{msup} - 3.6$

D. $h = -16\text{msup} + 51.84$

ID: d5b08036

$$y = 576^{(2x+2)}$$

The graph of the given equation in the *xy*-plane has a *y*-intercept of (r, s). Which of the following equivalent equations displays the value of s as a constant, a coefficient, or the base?

A. $y =$ msup

B. $y =$ msup

C. $y = \frac{1}{24}$ msup

D. $y = \frac{1}{576}$ msup

ID: 95954b57

The function f is defined by $f(x) = a^x + b$, where a and b are constants. In the xy-plane, the graph of $y = f(x)$ has an x-intercept at $(2, 0)$ and a y-intercept at $(0, -323)$. What is the value of b?

ID: 1b30fd79

x	$g(x)$
-27	3
-9	0
21	5

The table shows three values of x and their corresponding values of $g(x)$, where $g(x) = \frac{f(x)}{x+3}$ and f is a linear function. What is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(0, 36)$

B. $(0, 12)$

C. $(0, 4)$

D. $(0, -9)$

ID: 41ab1df4

$$f(x) = 272(2)^x$$

The function f is defined by the given equation. If $h(x) = f(x - 4)$, which of the following equations defines function h?

A. $h(x) = 17(2)^x$

B. $h(x) = 68(2)^x$

C. $h(x) = 272(16)^x$

D. $h(x) = 272(8)^x$

ID: 7b54c7af

The functions f and g are defined by the given equations, where $x \geq 0$. Which of the following equations displays, as a constant or coefficient, the maximum value of the function it defines, where $x \geq 0$?

I. $f(x) = 33(0.4)^{x+3}$

II. $g(x) = 33(0.16)(0.4)^{x-2}$

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: f9e32510

The function $f(x) = \frac{1}{9}(x - 7)^2 + 3$ gives a metal ball's height above the ground $f(x)$, in inches, x seconds after it started moving on a track, where $0 \leq x \leq 10$. Which of the following is the best interpretation of the vertex of the graph of $y = f(x)$ in the *xy*-plane?

A. The metal ball's minimum height was 3 inches above the ground.

B. The metal ball's minimum height was 7 inches above the ground.

C. The metal ball's height was 3 inches above the ground when it started moving.

D. The metal ball's height was 7 inches above the ground when it started moving.

ID: 23923e5b

A quadratic function models the height, in feet, of an object above the ground in terms of the time, in seconds, after the object is launched off an elevated surface. The model indicates the object has an initial height of 10 feet above the ground and reaches its maximum height of $1{,}034$ feet above the ground 8 seconds after being launched. Based on the model, what is the height, in feet, of the object above the ground 10 seconds after being launched?

A. 234

B. 778

C. 970

D. $1{,}014$

ID: 1ba110f2

$$P(t) = 260(1.04)^{(\frac{6}{4})t}$$

The function P models the population, in thousands, of a certain city t years after 2003. According to the model, the population is predicted to increase by 4% every n months. What is the value of n?

A. 8

B. 12

C. 18

D. 72

ID: aefae524

$$P(t) = 290(1.04)^{(\frac{4}{6})t}$$

The function P models the population, in thousands, of a certain city t years after 2005. According to the model, the population is predicted to increase by $n\%$ every 18 months. What is the value of n?

A. 0.38

B. 1.04

C. 4

D. 6

ID: 49de5e98

$$f(x) = 4x^2 - 50x + 126$$

The given equation defines the function f. For what value of x does $f(x)$ reach its minimum?

ID: 5e98384e

The function f is defined by $f(x) = (x - 6)(x - 2)(x + 6)$. In the *xy*-plane, the graph of $y = g(x)$ is the result of translating the graph of $y = f(x)$ up 4 units. What is the value of $g(0)$?

ID: c56a9f57

The first term of a sequence is 9. Each term after the first is 4 times the preceding term. If w represents the nth term of the sequence, which equation gives w in terms of n?

A. $w = 4(9^n)$

B. $w = 4(9^{n-1})$

C. $w = 9(4^n)$

D. $w = 9(4^{n-1})$

ID: 2f88a547

At the time that an article was first featured on the home page of a news website, there were 40 comments on the article. An exponential model estimates that at the end of each hour after the article was first featured on the home page, the number of comments on the article had increased by 190% of the number of comments on the article at the end of the previous hour. Which of the following equations best represents this model, where C is the estimated number of comments on the article t hours after the article was first featured on the home page and $t \leq 4$?

A. $C = 40$msup

B. $C = 40$msup

C. $C = 40$msup

D. $C = 40$msup

ID: d93eac68

Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x) - 15$ has a *y*-intercept at $\left(0, -\frac{99}{7}\right)$. The product of a and b is $\frac{65}{7}$. What is the value of a?

ID: ebf50998

Function f is defined by $f(x) = (x + 6)(x + 5)(x + 1)$. Function g is defined by $g(x) = f(x - 1)$. The graph of $y = g(x)$ in the *xy*-plane has *x*-intercepts at $(a, 0)$, $(b, 0)$, and $(c, 0)$, where a, b, and c are distinct constants. What is the value of $a + b + c$?

A. -15

B. -9

C. 11

D. 15

ID: 7189ece4

For the exponential function f, the value of $f(1)$ is k, where k is a constant. Which of the following equivalent forms of the function f shows the value of k as the coefficient or the base?

A. $f(x) = 50(2)^{x+1}$

B. $f(x) = 80(2)^{x}$

C. $f(x) = 128(2)^{x-1}$

D. $f(x) = 205(2)^{x-2}$

ID: ca44c7ce

$$f(x) = |59 - 2x|$$

The function f is defined by the given equation. For which of the following values of k does $f(k) = 3k$?

A. $\frac{59}{5}$

B. $\frac{59}{2}$

C. $\frac{177}{5}$

D. 59

ID: 5b955063

A rectangle has an area of 155 square inches. The length of the rectangle is 4 inches less than 7 times the width of the rectangle. What is the width of the rectangle, in inches?

ID: 99b8a5c8

$$f(x) = ax^2 + 4x + c$$

In the given quadratic function, a and c are constants. The graph of $y = f(x)$ in the *xy*-plane is a parabola that opens upward and has a vertex at the point (h, k), where h and k are constants. If $k < 0$ and $f(-9) = f(3)$, which of the following must be true?

I. $c < 0$

II. $a \geq 1$

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: 98f7ab7a

Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x) - 12$ has a *y*-intercept at $\left(0, -\frac{75}{7}\right)$. The product of a and b is $\frac{320}{7}$. What is the value of a?

ID: 06fac60b

$$f(x) = 5{,}470(0.64)^{\frac{x}{12}}$$

The function f gives the value, in dollars, of a certain piece of equipment after x months of use. If the value of the equipment decreases each year by $p\%$ of its value the preceding year, what is the value of p?

A. 4

B. 5

C. 36

D. 64

ID: da9efa2f

$$f(x) = (x - 14)(x + 19)$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

A. -266

B. -19

C. $-\frac{33}{2}$

D. $-\frac{5}{2}$

ID: 033e2be3

The functions f and g are defined by the given equations.

$$f(x) = 3 + \left| -2x - x^2 \right|$$

$$g(w) = \left| \frac{-w}{w-1} \right| - w + 5$$

If $f(-4) = c$, where c is a constant, what is the value of $g(c)$?

ID: b7f055bc

The function h is defined by $h(x) = a^x + b$, where a and b are positive constants. The graph of $y = h(x)$ in the xy-plane passes through the points $(0, 10)$ and $(-2, \frac{325}{36})$. What is the value of ab?

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. 54

D. 60

ID: aea3b524

Square P has a side length of x inches. Square Q has a perimeter that is 176 inches greater than the perimeter of square P. The function f gives the area of square Q, in square inches. Which of the following defines f?

A. $f(x) = (x + 44)^2$

B. $f(x) = (x + 176)^2$

C. $f(x) = (176x + 44)^2$

D. $f(x) = (176x + 176)^2$

ID: a9e93fa1

$$f(x) = 4x^2 + 64x + 262$$

The function g is defined by $g(x) = f(x + 5)$. For what value of x does $g(x)$ reach its minimum?

A. -13

B. -8

C. -5

D. -3

ID: af1aea31

Which of the following functions has(have) a minimum value at -3?

I. $f(x) = -6(3)^x - 3$

II. $g(x) = -3(6)^x$

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: c3e3b12e

The function f is defined by $f(x) = ax^2 + bx + c$, where a, b, and c are constants. The graph of $y = f(x)$ in the *xy*-plane passes through the points $(7, 0)$ and $(-3, 0)$. If a is an integer greater than 1, which of the following could be the value of $a + b$?

A. -6

B. -3

C. 4

D. 5

ID: c9e4bac1

A quadratic function models a projectile's height, in meters, above the ground in terms of the time, in seconds, after it was launched. The model estimates that the projectile was launched from an initial height of 7 meters above the ground and reached a maximum height of 51.1 meters above the ground 3 seconds after the launch. How many seconds after the launch does the model estimate that the projectile will return to a height of 7 meters?

A. 3

B. 6

C. 7

D. 9