

#1

ID: 301faf80

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?

#2

ID: 02060533

| $x$ | $g(x)$ |
|-----|--------|
| -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)

#3

ID: 91e7ea5e

$$h(x) = 2(x - 4)^2 - 32$$

The quadratic function  $h$  is defined as shown. In the  $xy$ -plane, the graph of  $y = h(x)$  intersects the  $x$ -axis at the points  $(0, 0)$  and  $(t, 0)$ , where  $t$  is a constant. What is the value of  $t$ ?

- A) 1
- B) 2
- C) 4
- D) 8

#4

ID: 358f18bc

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

What is the minimum value of the given function?

#5

ID: 8490cc45

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)

#6

ID: a9084ca4

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

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.

#7

ID: 2c6f214f

The first term of a sequence is 9. Each term after the first is 4 times the preceding term. If  $w$  represents the  $n$ th 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)  $w = 9(4^{n-1})$

#8

ID: b8f13a3a

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  $(0, -\frac{75}{7})$ . The product of  $a$  and  $b$  is  $\frac{320}{7}$ . What is the value of  $a$ ?

#9

ID: 40491607

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

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  $b$ ?

#10

ID: 7902bed0

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)  $h = -16(t - 1.8)^2 - 3.6$
- D)  $h = -16(t - 1.8)^2 + 51.84$

#11

ID: 4a0d0399

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  $b$ ?

#12

ID: 9654add7

$$f(x) = -500x^2 + 25000x$$

The revenue  $f(x)$ , in dollars, that a company receives from sales of a product is given by the function  $f$  above, where  $x$  is the unit price, in dollars, of the product. The graph of  $y = f(x)$  in the  $xy$ -plane intersects the  $x$ -axis at 0 and  $a$ . What does  $a$  represent?

- A) The revenue, in dollars, when the unit price of the product is \$0
- B) The unit price, in dollars, of the product that will result in maximum revenue
- C) The unit price, in dollars, of the product that will result in a revenue of \$0
- D) The maximum revenue, in dollars, that the company can make

#13

ID: 263f9937

Growth of a Culture of  
Bacteria

| Day | Number of bacteria per milliliter at end of day |
|-----|---|
| 1   | $2.5 \times 10^5$                               |
| 2   | $5.0 \times 10^5$                               |
| 3   | $1.0 \times 10^6$                               |

A culture of bacteria is growing at an exponential rate, as shown in the table above. At this rate, on which day would the number of bacteria per milliliter reach  $5.12 \times 10^8$ ?

- A) Day 5
- B) Day 9
- C) Day 11
- D) Day 12

#14

ID: 4dd4efcf

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

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

#15

ID: 2992ac30

$$P(t) = 260(1.04)^{\left(\frac{t}{n}\right)}$$

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

#16

ID: 841ef26c

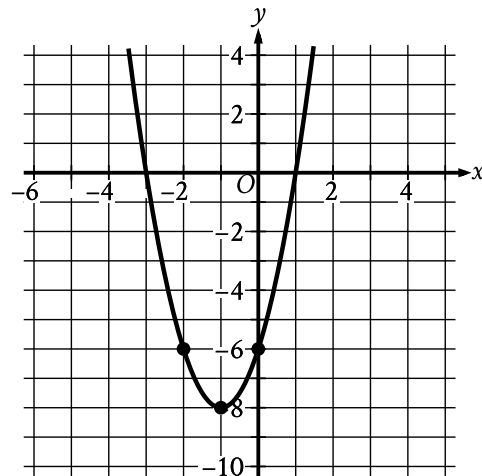
$$f(x) = 4x^2 + 64x + 262$$

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

#17

ID: 09d21d79



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

#18

ID: d135f4bf

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  $g(0)$ ?

#19

ID: 271ffad7

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

#20

ID: ee857afb

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

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

#21

ID: a45ffacb

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  $(0, -\frac{99}{7})$ . The product of  $a$  and  $b$  is  $\frac{65}{7}$ . What is the value of  $a$ ?

#22

ID: 821e724e

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  $g(0)$ ?

#23

ID: 18e35375

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

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)  $-\frac{5}{2}$

#24

ID: ce508fb0

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

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

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

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

#25

ID: ce579859

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)  $n = 72(1.5)^t$
- B)  $n = 72(2.5)^t$
- C)  $n = 180(1.5)^t$
- D)  $n = 180(2.5)^t$

#26

ID: 2f51abc2

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

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

#27

ID: 9afe2370

The population  $P$  of a certain city  $y$  years after the last census is modeled by the equation below, where  $r$  is a constant and  $P_0$  is the population when  $y = 0$ .

$$P = P_0(1 + r)^y$$

If during this time the population of the city decreases by a fixed percent each year, which of the following must be true?

- A)  $r < -1$
- B)  $-1 < r < 0$
- C)  $0 < r < 1$
- D)  $r > 1$

#28

ID: b7c74b73

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

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

#29

ID: f2d60b99

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.

#30

ID: 1f353a9e

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

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.

#31

ID: 270cf326

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

#32

ID: 92f812bb

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

#33

ID: 0121a235

$x$     $p(x)$

$x - 2$     $p(x)5$

$x - 1$     $p(x)0$

$x0$     $p(x) - 3$

$x1$     $p(x) - 1$

$x2$     $p(x)0$

The table above gives selected values of a polynomial function  $p$ . Based on the values in the table, which of the following must be a factor of  $p$  ?

- A)  $(x - 3)$
- B)  $(x + 3)$
- C)  $(x - 1)(x + 2)$
- D)  $(x + 1)(x - 2)$

#34

ID: bba18ecb

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  $(-\frac{17}{4}, 0)$ . What is the other  $x$ -intercept of the graph?

- A)  $(-\frac{29}{4}, 0)$
- B)  $(-\frac{7}{4}, 0)$
- C)  $(\frac{5}{4}, 0)$
- D)  $(\frac{17}{4}, 0)$



#35

ID: 70753f99

The function  $f$  is defined by  $f(x) = (x + 3)(x + 1)$ . The graph of  $f$  in the  $xy$ -plane is a parabola. Which of the following intervals contains the  $x$ -coordinate of the vertex of the graph of  $f$ ?

- A)  $-4 < x < -3$
- B)  $-3 < x < 1$
- C)  $1 < x < 3$
- D)  $3 < x < 4$

#36

ID: 58dcc59f

A landscaper is designing a rectangular garden. The length of the garden is to be 5 feet longer than the width. If the area of the garden will be 104 square feet, what will be the length, in feet, of the garden?

#37

ID: 2d1614a1

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

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

#38

ID: 84dd43f8

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  $f(2)$ ?

#39

ID: 59d1f4b5

$$M = 1,800(1.02)^t$$

The equation above models the number of members,  $M$ , of a gym  $t$  years after the gym opens. Of the following, which equation models the number of members of the gym  $q$  quarter years after the gym opens?

- A)  $M = 1,800(1.02)^{\frac{q}{4}}$
- B)  $M = 1,800(1.02)^{4q}$
- C)  $M = 1,800(1.005)^{4q}$
- D)  $M = 1,800(1.082)^q$

#40

ID: 01668cd6

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

#41

ID: 95eeeb5b

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

#42

ID: ef926848

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

#43

ID: 635f54ee

The surface area of a cube is  $6\left(\frac{a}{4}\right)^2$ , where  $a$  is a positive constant. Which of the following gives the perimeter of one face of the cube?

- A)  $\frac{a}{4}$
- B)  $a$
- C)  $4a$
- D)  $6a$

#44

ID: 70fb357b

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

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)  $y = 331,776^{(x+1)}$
- B)  $y = 24^{(4x+4)}$
- C)  $y = \frac{1}{24}(24)^{(4x+5)}$
- D)  $y = \frac{1}{576}(576)^{(2x+3)}$

#45

ID: de39858a

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

#46

ID: d41cf4d3

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)  $a < b$

#47

ID: 1178f2df

| $x$ | $y$ |
|-----|-----|
| 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?

#48

ID: 84e8cc72

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

#49

ID: cd358b89

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

#50

ID: 4b642eef

The total distance  $d$ , in meters, traveled by an object moving in a straight line can be modeled by a quadratic function that is defined in terms of  $t$ , where  $t$  is the time in seconds. At a time of 10.0 seconds, the total distance traveled by the object is 50.0 meters, and at a time of 20.0 seconds, the total distance traveled by the object is 200.0 meters. If the object was at a distance of 0 meters when  $t = 0$ , then what is the total distance traveled, in meters, by the object after 30.0 seconds?

#51

ID: 6d9e01a2

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

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

#52

ID: 9f2ecade

$$h(x) = x^3 + ax^2 + bx + c$$

The function  $h$  is defined above, where  $a$ ,  $b$ , and  $c$  are integer constants. If the zeros of the function are  $-5$ ,  $6$ , and  $7$ , what is the value of  $c$ ?

#55

ID: 04bbce67

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

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

#53

ID: 0e61101e

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

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

#56

ID: dcf63c94

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

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

#54

ID: 7a6d06bf

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?

#57

ID: 6f5540a5

Kao measured the temperature of a cup of hot chocolate placed in a room with a constant temperature of 70 degrees Fahrenheit ( $^{\circ}\text{F}$ ). The temperature of the hot chocolate was  $185^{\circ}\text{F}$  at 6:00 p.m. when it started cooling. The temperature of the hot chocolate was  $156^{\circ}\text{F}$  at 6:05 p.m. and  $135^{\circ}\text{F}$  at 6:10 p.m. The hot chocolate's temperature continued to decrease. Of the following functions, which best models the temperature  $T(m)$ , in degrees Fahrenheit, of Kao's hot chocolate  $m$  minutes after it started cooling?

A)  $T(m) = 1851.25m$

B)  $T(m) = 1850.85m$

C)  $T(m) = (185 - 70)(0.75)^{\frac{m}{5}}$

D)  $T(m) = 70 + 115(0.75)^{\frac{m}{5}}$

#58

ID: 1073d70c

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)  $C = 40(1.19)^t$

B)  $C = 40(1.9)^t$

C)  $C = 40(19)^t$

D)  $C = 40(2.9)^t$

#59

ID: 1fe10d97

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

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

#60

ID: b73ee6cf

The population of a town is currently 50,000, and the population is estimated to increase each year by 3% from the previous year. Which of the following equations can be used to estimate the number of years,  $t$ , it will take for the population of the town to reach 60,000 ?

- A)  $50,000 = 60,000(0.03)^t$
- B)  $50,000 = 60,000(3)^t$
- C)  $60,000 = 50,000(0.03)^t$
- D)  $60,000 = 50,000(1.03)^t$

#61

ID: 08d03fe4

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

#62

ID: 7eed640d

$$h(x) = -16x^2 + 100x + 10$$

The quadratic function above models the height above the ground  $h$ , in feet, of a projectile  $x$  seconds after it had been launched vertically. If  $y = h(x)$  is graphed in the  $xy$ -plane, which of the following represents the real-life meaning of the positive  $x$ -intercept of the graph?

- A) The initial height of the projectile
- B) The maximum height of the projectile
- C) The time at which the projectile reaches its maximum height
- D) The time at which the projectile hits the ground

#63

ID: 43926bd9

$$x \quad f(x)$$

$$1 \quad a$$

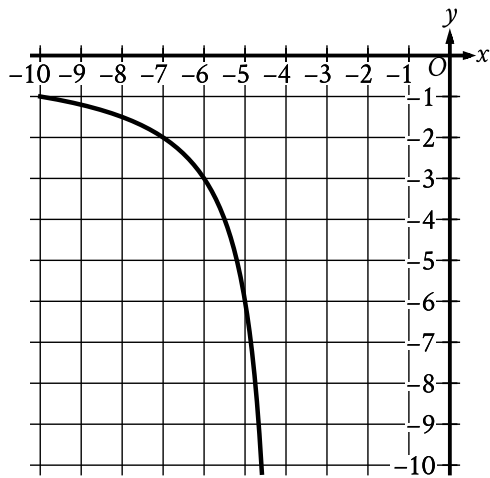
$$2 \quad a^5$$

$$3 \quad a$$

For the exponential function  $f$ , the table above shows several values of  $x$  and their corresponding values of  $f(x)$ , where  $a$  is a constant greater than 1. If  $k$  is a constant and  $f(k) = a$ , what is the value of  $k$  ?

#64

ID: 4d037075



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

#65

ID: 4d7064a6

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

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

#66

ID: 1853bb35

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



#67

ID: a8ae0d22

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)  $y = 4(x)^{200}$
- B)  $y = 4(200)^x$
- C)  $y = 200(x)^4$
- D)  $y = 200(4)^x$

#68

ID: 161126cf

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

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

- A) 16
- B) 21
- C) 46
- D) 96

#69

ID: a7711fe8

What is the minimum value of the function  $f$  defined by  $f(x) = (x - 2)^2 - 4$ ?

- A) -4
- B) -2
- C) 2
- D) 4

#70

ID: 1a722d7d

Let the function  $p$  be defined as

$$p(x) = \frac{(x - c)^2 + 160}{2c}, \text{ where } c \text{ is a}$$

constant. If  $p(c) = 10$ , what is the value of  $p(12)$ ?

- A) 10.00
- B) 10.25
- C) 10.75
- D) 11.00

#71

ID: 6e7ae9fc

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  $w$ ?

#72

ID: 48f83c34

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