#1

ID: beca03de

A rectangle has a length that is 15 times its width. The function $y = (15w)(w)$ represents this situation, where y is the area, in square feet, of the rectangle and $y > 0$. Which of the following is the best interpretation of $15w$ in this context?

A) The length of the rectangle, in feet

B) The area of the rectangle, in square feet

C) The difference between the length and the width of the rectangle, in feet

D) The width of the rectangle, in feet

#2

ID: 39714777

$$p(x) + 57 = x^2$$

The given equation relates the value of x and its corresponding value of $p(x)$ for the function p. What is the minimum value of the function p?

A) -3,249

B) -57

C) 57

D) 3,249

#3

ID: 52b1700c

Time (years)	Total amount (dollars)
0	604.00
1	606.42
2	608.84

Rosa opened a savings account at a bank. The table shows the exponential relationship between the time t, in years, since Rosa opened the account and the total amount n, in dollars, in the account. If Rosa made no additional deposits or withdrawals, which of the following equations best represents the relationship between t and n?

A) $n = (1 + 604)^t$

B) $n = (1 + 0.004)^t$

C) $n = 604(1 + 0.004)^t$

D) $n = 0.004(1 + 604)^t$

#4 ID: 02add2d2

A company has a newsletter. In January 2018, there were 1,300 customers subscribed to the newsletter. For the next 24 months after January 2018, the total number of customers subscribed to the newsletter each month was 7% greater than the total number subscribed the previous month. Which equation gives the total number of customers, c, subscribed to the company's newsletter m months after January 2018, where $m \leq 24$?

A) $c = 1{,}300(0.07)^m$

B) $c = 1{,}300(1.07)^m$

C) $c = 1{,}300(1.7)^m$

D) $c = 1{,}300(7)^m$

#5 ID: f89af023

A rectangular volleyball court has an area of 162 square meters. If the length of the court is twice the width, what is the width of the court, in meters?

A) 9

B) 18

C) 27

D) 54

#6 ID: e53add44

$S(n) = 38000an$

The function S above models the annual salary, in dollars, of an employee n years after starting a job, where a is a constant. If the employee's salary increases by 4% each year, what is the value of a ?

A) 0.04

B) 0.4

C) 1.04

D) 1.4

#7 ID: 926c246b

$D = 5640(1.9)t$

The equation above estimates the global data traffic D, in terabytes, for the year that is t years after 2010. What is the best interpretation of the number 5,640 in this context?

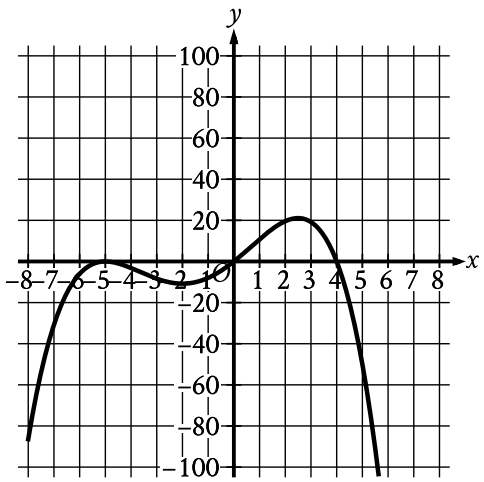
A) The estimated amount of increase of data traffic, in terabytes, each year

B) The estimated percent increase in the data traffic, in terabytes, each year

C) The estimated data traffic, in terabytes, for the year that is t years after 2010

D) The estimated data traffic, in terabytes, in 2010

#8 ID: 252a3b3a



Which of the following could be the equation of the graph shown in the *xy*-plane?

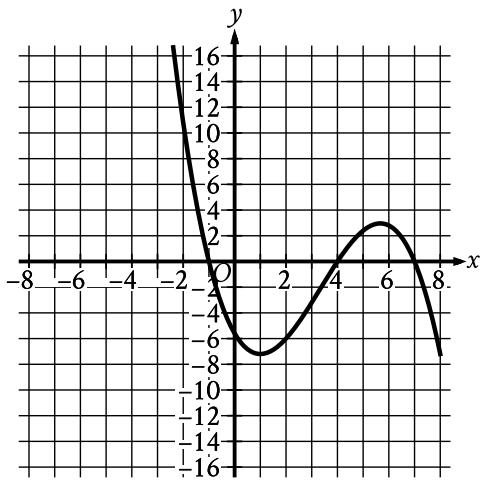
A) $y = -\frac{1}{10}x(x - 4)(x + 5)$

B) $y = -\frac{1}{10}x(x - 4)(x + 5)^2$

C) $y = -\frac{1}{10}x(x - 5)(x + 4)$

D) $y = -\frac{1}{10}x(x - 5)^2(x + 4)$

#9 ID: cc6ccd71



The graph of $y = f(x)$ is shown, where the function f is defined by $f(x) = ax^3 + bx^2 + cx + d$ and a, b, c, and d are constants. For how many values of x does $f(x) = 0$?

A) One

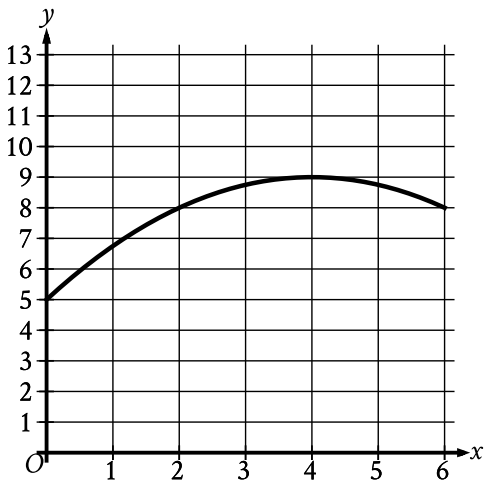
B) Two

C) Three

D) Four

#10

ID: 95d1c344



The graph models the number of active projects a company was working on x months after the end of November 2012, where $0 \leq x \leq 6$. According to the model, what is the predicted number of active projects the company was working on at the end of November 2012?

A) 0

B) 5

C) 8

D) 9

#11

ID: d4950429

A rectangle has a length of x units and a width of $(x - 15)$ units. If the rectangle has an area of 76 square units, what is the value of x?

A) 4

B) 19

C) 23

D) 76

#12

ID: 752055d1

A scientist initially measures 12,000 bacteria in a growth medium. 4 hours later, the scientist measures 24,000 bacteria. Assuming exponential growth, the formula $P = C(2)^{rt}$ gives the number of bacteria in the growth medium, where r and C are constants and P is the number of bacteria t hours after the initial measurement. What is the value of r?

A) $\frac{1}{12{,}000}$

B) $\frac{1}{4}$

C) 4

D) 12,000

#13

ID: 341ba5db

$$g(x) = x^2 + 55$$

What is the minimum value of the given function?

A) 0

B) 55

C) 110

D) 3,025

#14

ID: 15c364bf

A sample of a certain isotope takes 29 years to decay to half its original mass. The function $s(t) = 184(0.5)^{\frac{t}{29}}$ gives the approximate mass of this isotope, in grams, that remains t years after a 184-gram sample starts to decay. Which statement is the best interpretation of $s(87) = 23$ in this context?

A) Approximately 23 grams of the sample remains 87 years after the sample starts to decay.

B) The mass of the sample has decreased by approximately 23 grams 87 years after the sample starts to decay.

C) The mass of the sample has decreased by approximately 87 grams 23 years after the sample starts to decay.

D) Approximately 87 grams of the sample remains 23 years after the sample starts to decay.

#15

ID: f28944ff

$$q(x) = 32(2^x)$$

Which table gives three values of x and their corresponding values of $q(x)$ for function q?

A)

x	-1	0	1
$q(x)$	-64	0	64

B)

x	-1	0	1
$q(x)$	$\frac{1}{16}$	2	64

C)

x	-1	0	1
$q(x)$	$\frac{1}{16}$	32	64

D)

x	-1	0	1
$q(x)$	16	32	64

#16

ID: 50e40f08

$$f(x) = (x + 6)(x - 4)$$

If the given function f is graphed in the *xy*-plane, where $y = f(x)$, what is the *x*-coordinate of an *x*-intercept of the graph?

#17

ID: c4259674

The function f is defined by $f(x) = 4x^{-1}$. What is the value of $f(21)$?

A) -84

B) $\frac{1}{84}$

C) $\frac{4}{21}$

D) $\frac{21}{4}$

#18

ID: be0c419e

Immanuel purchased a certain rare coin on January 1. The function $f(x) = 65(1.03)^x$, where $0 \le x \le 10$, gives the predicted value, in dollars, of the rare coin x years after Immanuel purchased it. What is the best interpretation of the statement "$f(8)$ is approximately equal to 82" in this context?

A) When the rare coin's predicted value is approximately 82 dollars, it is 8% greater than the predicted value, in dollars, on January 1 of the previous year.

B) When the rare coin's predicted value is approximately 82 dollars, it is 8 times the predicted value, in dollars, on January 1 of the previous year.

C) From the day Immanuel purchased the rare coin to 8 years after Immanuel purchased the coin, its predicted value increased by a total of approximately 82 dollars.

D) 8 years after Immanuel purchased the rare coin, its predicted value is approximately 82 dollars.

#19

ID: a31417d1

From 2005 through 2014, the number of music CDs sold in the United States declined each year by approximately 15% of the number sold the preceding year. In 2005, approximately 600 million CDs were sold in the United States. Of the following, which best models C, the number of millions of CDs sold in the United States, t years after 2005?

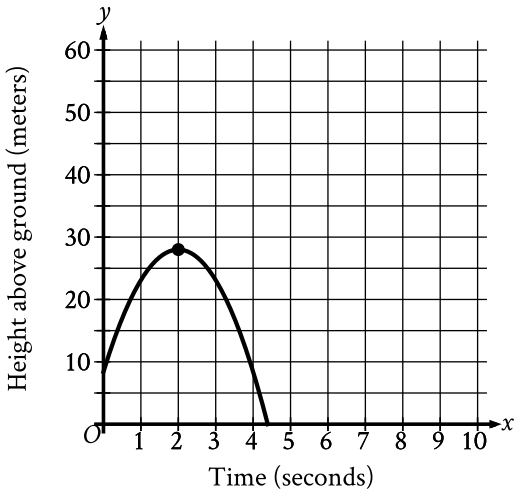
A) $C = 600(0.15)^t$

B) $C = 600(0.85)^t$

C) $C = 600(1.15)^t$

D) $C = 600(1.85)^t$

#20 ID: 197bed38



An object was launched upward from a platform. The graph shown models the height above ground, y, in meters, of the object x seconds after it was launched. For which of the following intervals of time was the height of the object increasing for the entire interval?

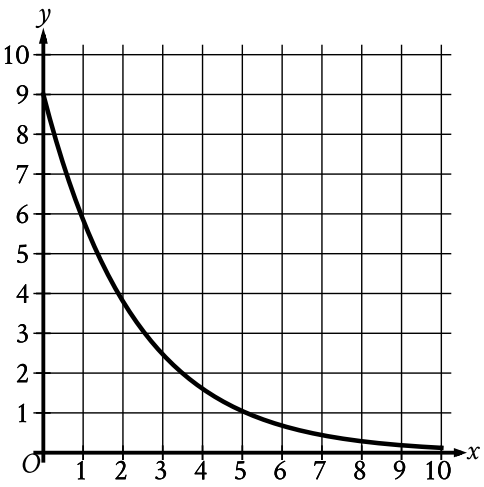
A) From $x = 0$ to $x = 2$

B) From $x = 0$ to $x = 4$

C) From $x = 2$ to $x = 3$

D) From $x = 3$ to $x = 4$

#21 ID: db888cd6



The graph gives the estimated number of catalogs y, in thousands, a company sent to its customers at the end of each year, where x represents the number of years since the end of 1992, where $0 \le x \le 10$. Which statement is the best interpretation of the y-intercept in this context?

A) The estimated total number of catalogs the company sent to its customers during the first 10 years was $9{,}000$.

B) The estimated total number of catalogs the company sent to its customers from the end of 1992 to the end of 2002 was 90.

C) The estimated number of catalogs the company sent to its customers at the end of 1992 was 9.

D) The estimated number of catalogs the company sent to its customers at the end of 1992 was $9{,}000$.

#22

ID: 6ecdbcb4

$$f(x) = (x + 6)(x + 5)(x - 4)$$

The function f is given. Which table of values represents $y = f(x) - 3$?

A)

x	y
-6	-9
-5	-8
4	1

B)

x	y
-6	-3
-5	-3
4	-3

C)

x	y
-6	-3
-5	-2
4	7

D)

x	y
-6	3
-5	3
4	3

#23

ID: 203774bc

The product of two positive integers is 546. If the first integer is 11 greater than twice the second integer, what is the smaller of the two integers?

A) 7

B) 14

C) 39

D) 78

#24

ID: c4cd5bcc

In the xy-plane, the y-coordinate of the y-intercept of the graph of the function f is c. Which of the following must be equal to c ?

A) $f(0)$

B) $f(1)$

C) $f(2)$

D) $f(3)$

#25

ID: dc77e0dc

$$f(t) = 500(0.5)^{\frac{t}{12}}$$

The function f models the intensity of an X-ray beam, in number of particles in the X-ray beam, t millimeters below the surface of a sample of iron. According to the model, what is the estimated number of particles in the X-ray beam when it is at the surface of the sample of iron?

A) 500

B) 12

C) 5

D) 2

#26

ID: 735a0a00

$$y = 0.25x^2 - 7.5x + 90.25$$

The equation gives the estimated stock price y, in dollars, for a certain company x days after a new product launched, where $0 \le x \le 20$. Which statement is the best interpretation of $(x, y) = (1, 83)$ in this context?

A) The company's estimated stock price increased $\$ 83$ every day after the new product launched.

B) The company's estimated stock price increased $\$ 1$ every 83 days after the new product launched.

C) 1 day after the new product launched, the company's estimated stock price is $\$ 83$.

D) 83 days after the new product launched, the company's estimated stock price is $\$ 1$.

#27

ID: 78d5f91a

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

For the function f defined above, what is the value of $f - 1$?

A) -11

B) -7

C) 7

D) 11

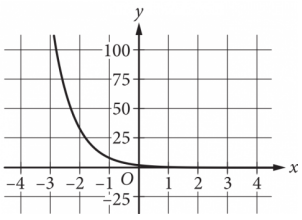
#28

ID: d675744f

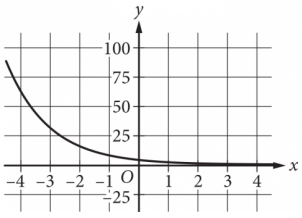
$$y = 4(2^x)$$

Which of the following is the graph in the xy-plane of the given equation?

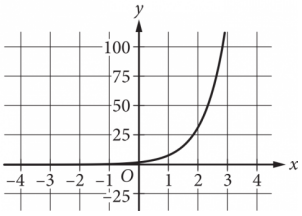
A)



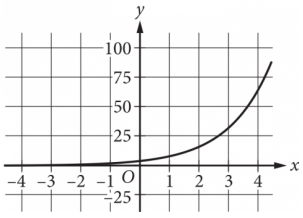
B)



C)



D)



#29

ID: 67f4b449

The function $f(w) = 6w^2$ gives the area of a rectangle, in square feet (ft^2), if its width is w ft and its length is 6 times its width. Which of the following is the best interpretation of $f(14) = 1{,}176$?

A) If the width of the rectangle is 14 ft, then the area of the rectangle is 1,176 ft^2.

B) If the width of the rectangle is 14 ft, then the length of the rectangle is 1,176 ft.

C) If the width of the rectangle is 1,176 ft, then the length of the rectangle is 14 ft.

D) If the width of the rectangle is 1,176 ft, then the area of the rectangle is 14 ft^2.

#30

ID: 44076c7d

x	$f(x)$
-1	10
0	14
1	20

For the quadratic function f, the table shows three values of x and their corresponding values of $f(x)$. Which equation defines f?

A) $f(x) = 3x^2 + 3x + 14$

B) $f(x) = 5x^2 + x + 14$

C) $f(x) = 9x^2 - x + 14$

D) $f(x) = x^2 + 5x + 14$

#31

ID: f44a29a8

An object's kinetic energy, in joules, is equal to the product of one-half the object's mass, in kilograms, and the square of the object's speed, in meters per second. What is the speed, in meters per second, of an object with a mass of 4 kilograms and kinetic energy of 18 joules?

A) 3

B) 6

C) 9

D) 36

#32

ID: d71f6dbf

The height, in feet, of an object x seconds after it is thrown straight up in the air can be modeled by the function $h(x) = -16x^2 + 20x + 5$. Based on the model, which of the following statements best interprets the equation $h1.4 = 1.64$?

A) The height of the object 1.4 seconds after being thrown straight up in the air is 1.64 feet.

B) The height of the object 1.64 seconds after being thrown straight up in the air is 1.4 feet.

C) The height of the object 1.64 seconds after being thrown straight up in the air is approximately 1.4 times as great as its initial height.

D) The speed of the object 1.4 seconds after being thrown straight up in the air is approximately 1.64 feet per second.

#33

ID: 6676f055

$$f(\theta) = -0.28(\theta - 27)^2 + 880$$

An engineer wanted to identify the best angle for a cooling fan in an engine in order to get the greatest airflow. The engineer discovered that the function above models the airflow $f(\theta)$, in cubic feet per minute, as a function of the angle of the fan θ, in degrees. According to the model, what angle, in degrees, gives the greatest airflow?

A) –0.28

B) 0.28

C) 27

D) 880

#34

ID: 90bcaa61

The function $f(t) = 60{,}000(2)^{\frac{t}{110}}$ gives the number of bacteria in a population t minutes after an initial observation. How much time, in minutes, does it take for the number of bacteria in the population to double?

#35

ID: dd8ac009

Time (years)	Total amount (dollars)
0	670.00
1	674.02
2	678.06

Sara opened a savings account at a bank. The table shows the exponential relationship between the time t, in years, since Sara opened the account and the total amount d, in dollars, in the account. If Sara made no additional deposits or withdrawals, which of the following equations best represents the relationship between t and d ?

A) $d = 0.006(1 + 670)^t$

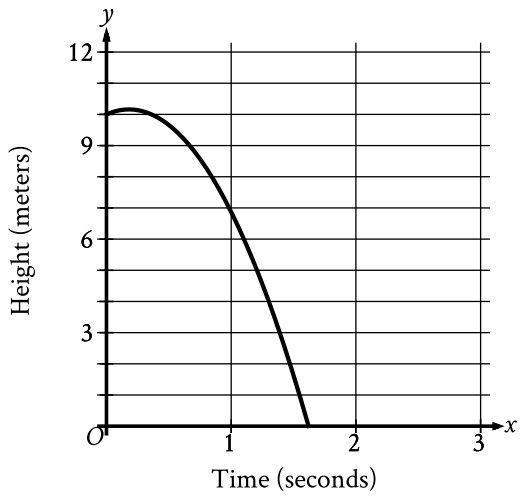
B) $d = 670(1 + 0.006)^t$

C) $d = (1 + 0.006)^t$

D) $d = (1 + 670)^t$

#36

ID: 9ff88bb5



A competitive diver dives from a platform into the water. The graph shown gives the height above the water y, in meters, of the diver x seconds after diving from the platform. What is the best interpretation of the *x*-intercept of the graph?

A) The diver reaches a maximum height above the water at 1.6 seconds.

B) The diver hits the water at 1.6 seconds.

C) The diver reaches a maximum height above the water at 0.2 seconds.

D) The diver hits the water at 0.2 seconds.

#37

ID: 281a4f3b

A certain college had 3,000 students enrolled in 2015. The college predicts that after 2015, the number of students enrolled each year will be 2% less than the number of students enrolled the year before. Which of the following functions models the relationship between the number of students enrolled, $f(x)$, and the number of years after 2015, x ?

A) $f(x) = 0.02(3{,}000)^x$

B) $f(x) = 0.98(3{,}000)^x$

C) $f(x) = 3{,}000(0.02)^x$

D) $f(x) = 3{,}000(0.98)^x$

#38

ID: 100030d9

A rubber ball bounces upward one-half the height that it falls each time it hits the ground. If the ball was originally dropped from a distance of 20.0 feet above the ground, what was its maximum height above the ground, in feet, between the third and fourth time it hit the ground?

#39 ID: 7ba694f3

The number of bacteria in a liquid medium doubles every day. There are $44{,}000$ bacteria in the liquid medium at the start of an observation. Which represents the number of bacteria, y, in the liquid medium t days after the start of the observation?

A) $y = \frac{1}{2}(44{,}000)^t$

B) $y = 2(44{,}000)^t$

C) $y = 44{,}000(\frac{1}{2})^t$

D) $y = 44{,}000(2)^t$

#40 ID: c7a187a7

$$f(x) = x^2 - 18x - 360$$

If the given function f is graphed in the *xy*-plane, where $y = f(x)$, what is an *x*-intercept of the graph?

A) $(-12, 0)$

B) $(-30, 0)$

C) $(-360, 0)$

D) $(12, 0)$

#41 ID: a26c29f7

The function f is defined by $f(x) = 7x^3$. In the *xy*-plane, the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down 2 units. Which equation defines function g?

A) $g(x) = \frac{7}{2}x^3$

B) $g(x) = 7x^{\frac{3}{2}}$

C) $g(x) = 7x^3 + 2$

D) $g(x) = 7x^3 - 2$

#42 ID: e1391dd6

According to Moore's law, the number of transistors included on microprocessors doubles every 2 years. In 1985, a microprocessor was introduced that had 275,000 transistors. Based on this information, in which of the following years does Moore's law estimate the number of transistors to reach 1.1 million?

A) 1987

B) 1989

C) 1991

D) 1994

#43

ID: 3c600337

The function f is defined by $f(x) = 270(0.1)^x$. What is the value of $f(0)$?

A) 0

B) 1

C) 27

D) 270

#44

ID: 4209aefe

The function $f(x) = 206(1.034)^x$ models the value, in dollars, of a certain bank account by the end of each year from 1957 through 1972, where x is the number of years after 1957. Which of the following is the best interpretation of "$f(5)$ is approximately equal to 243" in this context?

A) The value of the bank account is estimated to be approximately 5 dollars greater in 1962 than in 1957.

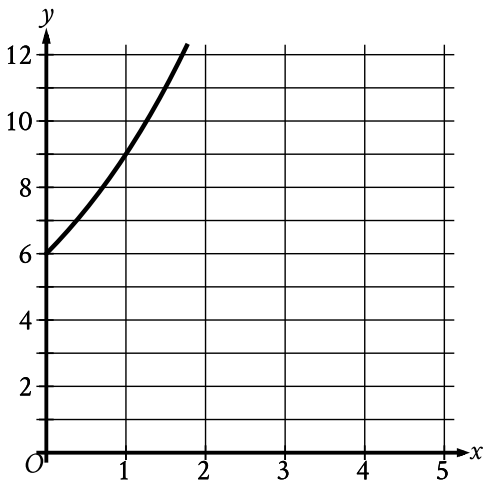
B) The value of the bank account is estimated to be approximately 243 dollars in 1962.

C) The value, in dollars, of the bank account is estimated to be approximately 5 times greater in 1962 than in 1957.

D) The value of the bank account is estimated to increase by approximately 243 dollars every 5 years between 1957 and 1972.

#45

ID: f1fa0821



The graph gives the estimated population y, in thousands, of a town x years since 2003, where $0 \le x \le 5$. Which of the following best describes the increase in the estimated population from $x = 0$ to $x = 1$?

A) The estimated population at $x = 1$ is 0.5 times the estimated population at $x = 0$.

B) The estimated population at $x = 1$ is 1.5 times the estimated population at $x = 0$.

C) The estimated population at $x = 1$ is 2.5 times the estimated population at $x = 0$.

D) The estimated population at $x = 1$ is 3.5 times the estimated population at $x = 0$.

#46

ID: 5bf0f84a

$h(t) = -16t^2 + 110t + 72$

The function above models the height h, in feet, of an object above ground t seconds after being launched straight up in the air. What does the number 72 represent in the function?

A) The initial height, in feet, of the object

B) The maximum height, in feet, of the object

C) The initial speed, in feet per second, of the object

D) The maximum speed, in feet per second, of the object

#47

ID: c048055c

A model predicts that the population of Springfield was $15{,}000$ in 2005. The model also predicts that each year for the next 5 years, the population p increased by 4% of the previous year's population. Which equation best represents this model, where x is the number of years after 2005, for $x \leq 5$?

A) $p = 0.96(15{,}000)^x$

B) $p = 1.04(15{,}000)^x$

C) $p = 15{,}000(0.96)^x$

D) $p = 15{,}000(1.04)^x$

#48

ID: 70ebd3d0

$N(d) = 115(0.90)^d$

The function N defined above can be used to model the number of species of brachiopods at various ocean depths d, where d is in hundreds of meters. Which of the following does the model predict?

A) For every increase in depth by 1 meter, the number of brachiopod species decreases by 115.

B) For every increase in depth by 1 meter, the number of brachiopod species decreases by 10%.

C) For every increase in depth by 100 meters, the number of brachiopod species decreases by 115.

D) For every increase in depth by 100 meters, the number of brachiopod species decreases by 10%.

#49

ID: 45df91ee

$g(x) = 11(\frac{1}{12})^x$

If the given function g is graphed in the xy-plane, where $y = g(x)$, what is the y-intercept of the graph?

A) $(0, 11)$

B) $(0, 132)$

C) $(0, 1)$

D) $(0, 12)$

#50

ID: 97158b3a

The area A, in square centimeters, of a rectangular painting can be represented by the expression $w(w + 29)$, where w is the width, in centimeters, of the painting. Which expression represents the length, in centimeters, of the painting?

A) w

B) 29

C) $(w + 29)$

D) $w(w + 29)$

#51

ID: d8ace155

A company opens an account with an initial balance of $\$ 36{,}100.00$. The account earns interest, and no additional deposits or withdrawals are made. The account balance is given by an exponential function A, where $A(t)$ is the account balance, in dollars, t years after the account is opened. The account balance after 13 years is $\$ 68{,}071.93$. Which equation could define A?

A) $A(t) = 36{,}100.00(1.05)^t$

B) $A(t) = 31{,}971.93(1.05)^t$

C) $A(t) = 31{,}971.93(0.05)^t$

D) $A(t) = 36{,}100.00(0.05)^t$

#52

ID: dba7432e

x	f(x)
0	5
1	$\frac{5}{2}$
2	
3	

The table above gives the values of the function f for some values of x. Which of the following equations could define f ?

A) $f(x) = 5(2^{x+1})$

B) $f(x) = 5(2^x)$

C) $f(x) = 5(2^{-(x+1)})$

D) $f(x) = 5(2 - x)$

#53

ID: f1c81b3b

The exponential function g is defined by $g(x) = 19 \cdot a^x$, where a is a positive constant. If $g(3) = 2{,}375$, what is the value of $g(4)$?

#54

ID: c19d1fb0

An egg is thrown from a rooftop. The equation $h = -4.9t^2 + 9t + 18$ represents this situation, where h is the height of the egg above the ground, in meters, t seconds after it is thrown. According to the equation, what is the height, in meters, from which the egg was thrown?

#55

ID: 0aaef7aa

The function p is defined by $p(n) = 7n^3$. What is the value of n when $p(n)$ is equal to 56?

A) 2

B) $\frac{8}{3}$

C) 7

D) 8

#56

ID: b7cd6ca6

The equation $E(t) = 5(1.8)^t$ gives the estimated number of employees at a restaurant, where t is the number of years since the restaurant opened. Which of the following is the best interpretation of the number 5 in this context?

A) The estimated number of employees when the restaurant opened

B) The increase in the estimated number of employees each year

C) The number of years the restaurant has been open

D) The percent increase in the estimated number of employees each year

#57

ID: f5e8ccf1

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

The function f is defined above. Which of the following is NOT an x-intercept of the graph of the function in the xy-plane?

A) $(-\frac{4}{4}, 0)$

B) $(-\frac{23}{23}, 0)$

C) $(1, 0)$

D) $(32, 0)$

#58 ID: aa95fb33

The graph of the rational function f is shown, where $y = f(x)$ and $x \geq 0$. Which of the following is the graph of $y = f(x) + 5$, where $x \geq 0$?

A)

B)

C)

D)

#59 ID: 3918e8bc

An object is kicked from a platform. The equation $h = -4.9t^2 + 7t + 9$ represents this situation, where h is the height of the object above the ground, in meters, t seconds after it is kicked. Which number represents the height, in meters, from which the object was kicked?

A) 0

B) 4.9

C) 7

D) 9

#60 ID: 7e5a3640

Bacteria are growing in a liquid growth medium. There were $300{,}000$ cells per milliliter during an initial observation. The number of cells per milliliter doubles every 3 hours. How many cells per milliliter will there be 15 hours after the initial observation?

A) $1{,}500{,}000$

B) $2{,}400{,}000$

C) $4{,}500{,}000$

D) $9{,}600{,}000$

#61

ID: 4993b828

The area A, in square centimeters, of a rectangular cutting board can be represented by the expression $w(w+9)$, where w is the width, in centimeters, of the cutting board. Which expression represents the length, in centimeters, of the cutting board?

A) $w(w+9)$

B) w

C) 9

D) $(w+9)$

#62

ID: 981aca65

$$f(x) = \frac{a-19}{x} + 5$$

In the given function f, a is a constant. The graph of function f in the *xy*-plane, where $y = f(x)$, is translated 3 units down and 4 units to the right to produce the graph of $y = g(x)$. Which equation defines function g?

A) $g(x) = \frac{a-19}{x+4} + 2$

B) $g(x) = \frac{a-19}{x-4} + 2$

C) $g(x) = \frac{a-22}{x+4} + 5$

D) $g(x) = \frac{a-22}{x-4} + 5$

#63

ID: 7a4475df

A function p estimates that there were $2{,}000$ animals in a population in 1998. Each year from 1998 to 2010, the function estimates that the number of animals in this population increased by 3% of the number of animals in the population the previous year. Which equation defines this function, where $p(x)$ is the estimated number of animals in the population x years after 1998?

A) $p(x) = 2{,}000(3)^x$

B) $p(x) = 2{,}000(1.97)^x$

C) $p(x) = 2{,}000(1.03)^x$

D) $p(x) = 2{,}000(0.97)^x$

#64

ID: 5c00c2c1

There were no jackrabbits in Australia before 1788 when 24 jackrabbits were introduced. By 1920 the population of jackrabbits had reached 10 billion. If the population had grown exponentially, this would correspond to a 16.2% increase, on average, in the population each year. Which of the following functions best models the population $p(t)$ of jackrabbits t years after 1788?

A) $p(t) = 1.162(24)^t$

B) $p(t) = 24(2)^{1.162t}$

C) $p(t) = 24(1.162)^t$

D) $p(t) = (24 \cdot 1.162)^t$