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1

Function f is a quadratic function where $f(-20) = 0$ and $f(-4) = 0$. The graph of $y = f(x)$ in the xy-plane has a vertex at (r, -64). What is the value of r?

Answer Preview:

2

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

I. $f(x) = 18(1.4)^{X+5}$

II. $f(x) = 18(1.16)(1.4)^{X+3}$

A) I only
B) II only
C) I and II
D) Neither I nor II

3

The perimeter of an isosceles right triangle is $18 + 18\sqrt{2}$ inches. Whag is the lengh, in inches, of the hypotenuse of this triangle?

A) 9
B) $9\sqrt{2}$
C) 18
D) $18\sqrt{2}$

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4

$$\frac{12x+28}{4} - \frac{s}{13} = r(x - 8)$$

In the given equation, s and r are constants, and $s > 0$. If the equation has infinitely many solutions, what is the value of s?

Answer Preview:

5

An object's speed is increasing at a rate of **2.7** meters per second squared. What is this rate, in **miles per minute squared** rounded to the nearest tenth? (**Use 1 mile = 1,609 meters**.)

A) 0.1
B) 6
C) 72.4
D) 595.9

6

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 (8, 0) and (-2, 0). If a is an integer greater than 1, which of the following could be the value of $a + b$?

A) -10
B) -5
C) 6
D) 7

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7

The edge length, in inches, of cube Y is 3/64 the edge length, in inches, of cube X. The surface area, in square inches, ot cube Y is n times the surface area, in square inches, of cube X. What is the value of n?

A) 9/4096
B) 27/2048
C) 3/64
D) 9/32

8

$$7x + 4y = 3$$
$$35x + 20y = 15$$

For each real number r, which of the following points lies on the graph of each equation in the xy-plane for the given system?

A) $(\frac{r}{5} + 3, -\frac{r}{5} + 15)$

B) $(-\frac{4r}{7} + \frac{3}{7}, r)$

C) $(r, \frac{7r}{4} + \frac{3}{4})$

D) $(r, -\frac{4r}{7} + \frac{3}{7})$

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9

The cost of renting a piece of construction equipment for up to 5 days is $270 for the first day and $135 for each additional day. Which of the following equations gives the cost y, in dollars, of renting the equipment for x days, where x is a positive integer and $x \leq 5$?

A) $y = 135x + 135$
B) $y = 270x - 135$
C) $y = 270x + 135$
D) $y = 135x + 270$

10

A right triangular pyramid has exactly six edges. Each of these edges is **96** centimeters long. If the surface area of the pyramid is $k\sqrt{3}$ square centimeters, what is the value of k?

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11

$$r(t) = 53t - 2t^2$$

The function r is defined by the given equation. The function s is defined by $s(t) = r(t) + 1$. Which expression represents the maximum value of $s(t)$?

A) $1 - \left(\frac{53}{2}\right)^2$

B) $1 - 2\left(\frac{53}{4}\right)^2$

C) $1 + 2\left(\frac{53}{4}\right)^2$

D) $1 + \left(\frac{53}{2}\right)^2$

12

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 (10, 0) and (-5, 0). If a is an integer greater than 1, which of the following could be the value of $a + b$?

A) -8
B) -4
C) 5
D) 6

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13

Hector used a tool called an auger to remove corn from a storage bin at a constant rate. The bin contained 24,000 bushels of corn when Hector began to use the auger. After 5 hours of using the auger, 19,350 bushels of corn remained in the bin. If the auger continues to remove corn at this rate, what is the total number of hours Hector will have been using the auger when 12,840 bushels of corn remain in the bin?

A) 3
B) 7
C) 8
D) 12

14

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by $5. Assuming gasoline costs $4 per gallon, which equation can Alan use to determine how many fewer average miles, ***m***, he should drive each week?

A) $\frac{25}{4}$ m = 95

B) $\frac{25}{4}$ m = 5

C) $\frac{4}{25}$ m = 95

D) $\frac{4}{25}$ m = 5

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15

x	y
k	13
k + 7	-15

The table gives the coordinates of two points on a line in the xy-plane. The y-intercept of the line is $(k - 5, b)$, where k and b are constants. What is the value of b?

Answer Preview:

16

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

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17

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

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

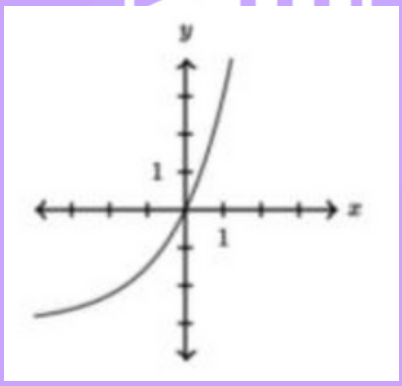
Answer Preview:

18

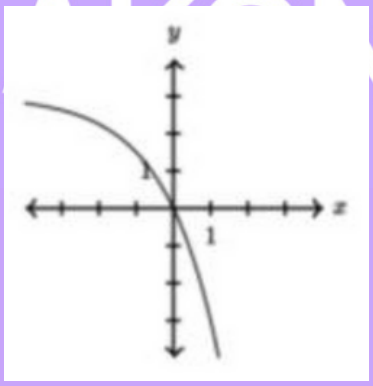
$$f(x) = 3(2)^x - 3$$

The function f is defined by the given equation. Which of the following is the graph of $y = f(x)$ in the xy-plane?

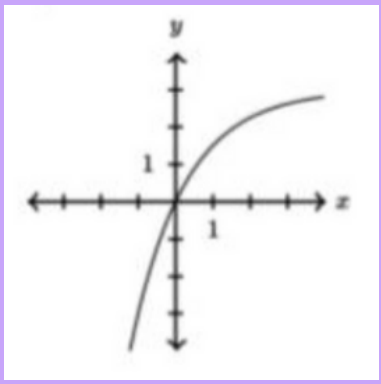
A)



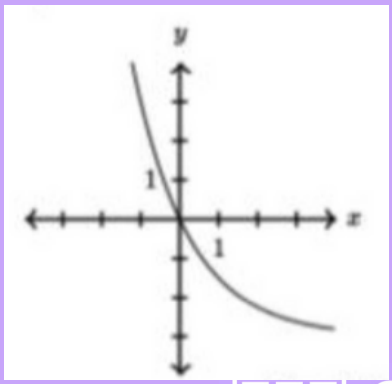
C)



B)



D)



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The function f is defined by $f(x) = \frac{|x|}{a} - 17$, where $a < 0$. What is the product of $f(18a)$ and $f(8a)$?

Answer Preview:

20

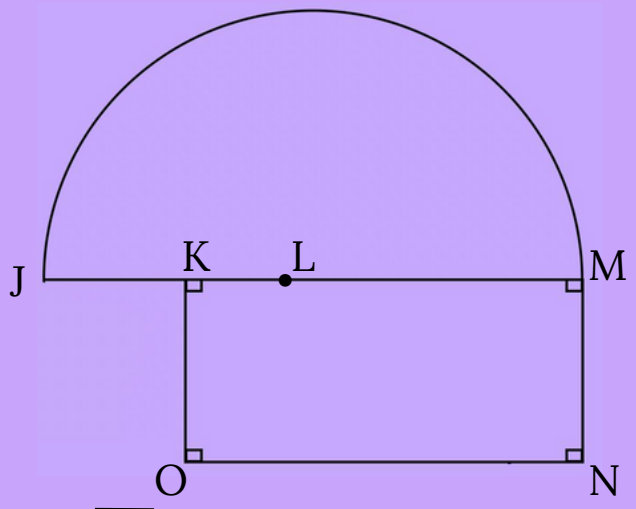
A quadratic model gives the predicted instantaneous rate of change, **in bacteria per hour**, of a bacteria population as a function of the population size. According to the model, the predicted instantaneous rate of change is **0** bacteria per hour for a population size of **0**, and the maximum predicted instantaneous rate of change is **0.200** bacteria per hour for a population size of **7,000**. Based on this model, what is the predicted instantaneous rate of change, in bacteria per hour, of che bacteria population for a population size of **700**?

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21



In the figure shown, $\overline{JM}$ is the diameter and $\overline{LM}$ is a radius of the semicircle **L**, and point **K** is the midpoint of $\overline{JL}$. If the length of $\overline{KL}$ is **13** units and the length of $\overline{MN}$ is **14** units. which expression represents the area, in square units, of this figure?

A) $546 + 676\pi$
B) $364 + 676\pi$
C) $546 + 338\pi$
D) $364 + 338\pi$

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22

$$38z^{18} + bz^{9} + 30$$

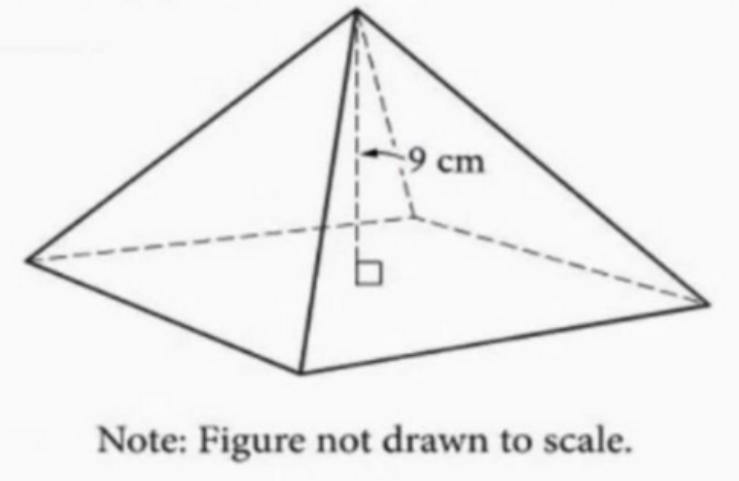
In the given expression, b is a positive integer If $qz^{9} + r$ is a factor of the expression, where q and r are positive integers, what is the greatest possible value of b?

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Note: Figure not drawn to scale.

The right square pyramid shown has a height of **9 centimeters (cm)**. The length, **in cm**, of one edge of the pyramid's base is 13/3 times the height of the pyramid. What is the volume, **in cm^3**, of the pyramid?

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Answer Preview:

24

As the size of a firework's shell increases, the height above the ground when the firework bursts increases. For a firework to burst **1,075** feet above the ground, a firework's shell in the shape of a sphere with a volume of **514.23** cubic inches could be used. To the nearest whole number, what is the volume of this firework's shell in cubic centimeters?
(1 inch = 2.54 centimeters

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