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**Online Homework**

**Focused Exercises for Math SAT**

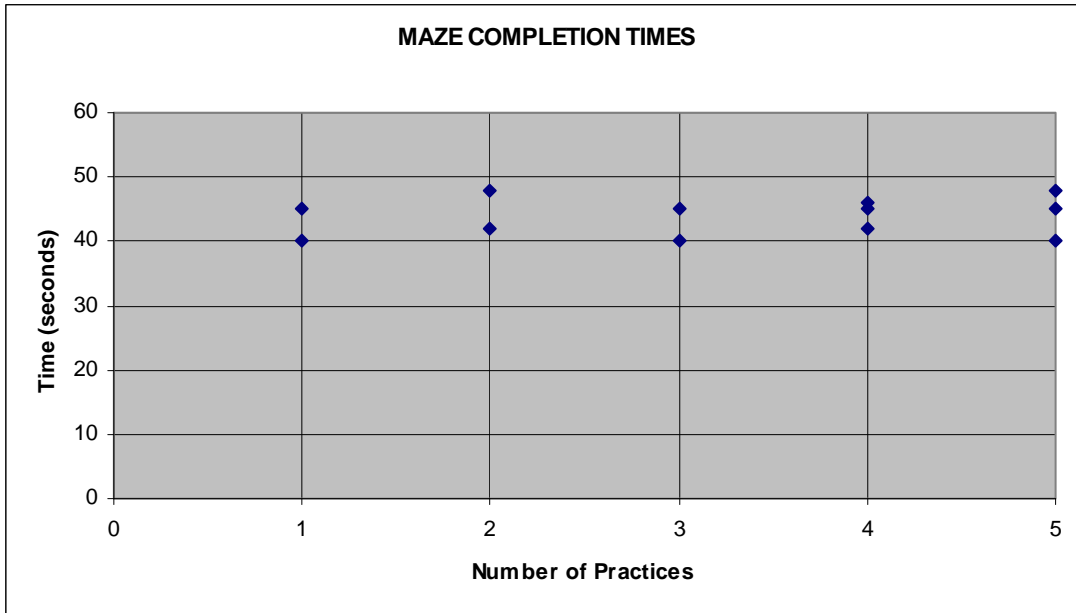
**Skill Set 2: Functions**

Many of the problems in this exercise set came from The College Board, writers of the SAT exam.

1. An exhibitor is selling decorative wreaths at an arts and crafts show. The net profit  $P$ , in dollars, from the sales of the wreaths is given by  $P(n) = 0.75n - 50$ , where  $n$  is the number of wreaths sold. How many wreaths must the exhibitor sell in order to earn a net profit of \$100?
- (A) 25  
(B) 75  
(C) 150  
(D) 175  
(E) 200
2. If  $f(x) = \frac{3 - 2x^2}{x}$  for all nonzero  $x$ , then  $f(2) =$
- (A)  $\frac{11}{2}$   
(B)  $\frac{7}{2}$   
(C)  $-\frac{1}{2}$   
(D)  $-\frac{5}{2}$   
(E)  $-7$
3. A group of students washed cars to raise money. The net amount  $A$ , in dollars, raised by washing  $k$  cars is given by the function  $A(k) = 4k - 30$ . If the group washed 15 cars, what is the net amount they raised?
- (A) \$10  
(B) \$15  
(C) \$20  
(D) \$25  
(E) \$30
4. Let the function  $h$  be defined by  $h(x) = 14 + \frac{x^2}{4}$ . If  $h(2m) = 9m$ , what is one possible value of  $m$ ?

5. For which of the following functions is  $f(-3) > f(3)$  ?
- (A)  $f(x) = 4x^2$
- (B)  $f(x) = 4$
- (C)  $f(x) = \frac{4}{x}$
- (D)  $f(x) = 4 - x^3$
- (E)  $f(x) = x^4 + 4$
6. The total daily cost  $c$ , in dollars, of producing  $x$  units of a certain product is given by the function  $c(x) = \frac{600x - 200}{x} + k$ , where  $k$  is a constant and  $x \leq 100$ . If 20 units were produced yesterday for a total cost of \$640, what is the value of  $k$  ?
- (A) 40
- (B) 50
- (C) 60
- (D) 590
- (E) 600
7. Let the function  $f$  be defined by  $f(x) = x + 1$ . If  $2f(p) = 20$ , what is the value of  $f(3p)$  ?

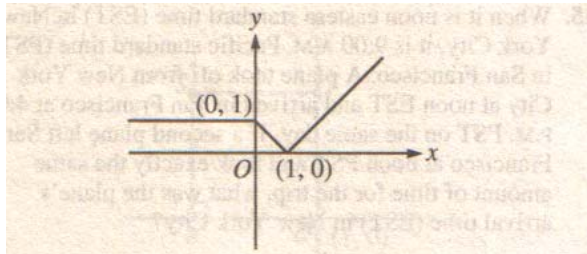
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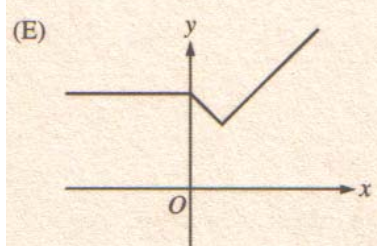
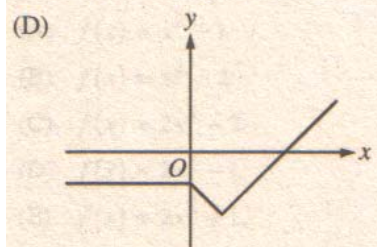
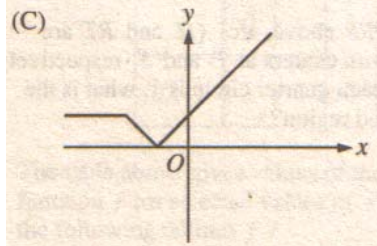
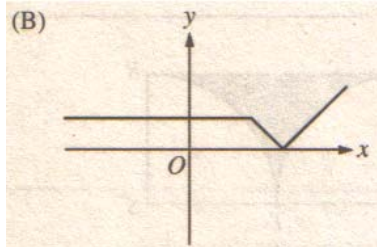
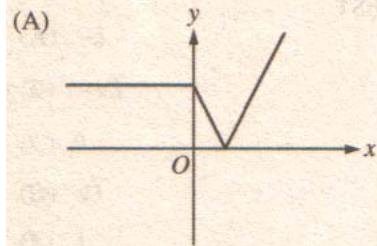
Doug's biology experiment involved timing 12 hamsters in a maze. Each hamster received at least one practice before being timed. The scatterplot above shows the time each hamster took to complete the maze and the corresponding number of practices that each hamster received. Based on the data, which of the following functions best models the relationship between  $t$ , the number of seconds to complete the maze, and  $p$ , the number of practices?

- (A)  $t(p) = 44$
- (B)  $t(p) = p$
- (C)  $t(p) = 44p$
- (D)  $t(p) = \frac{p}{44}$
- (E)  $t(p) = p + 44$

9.



The graph of  $y = f(x)$  is shown above. Which of the following could be the graph of  $y = f(x + 2)$ ?

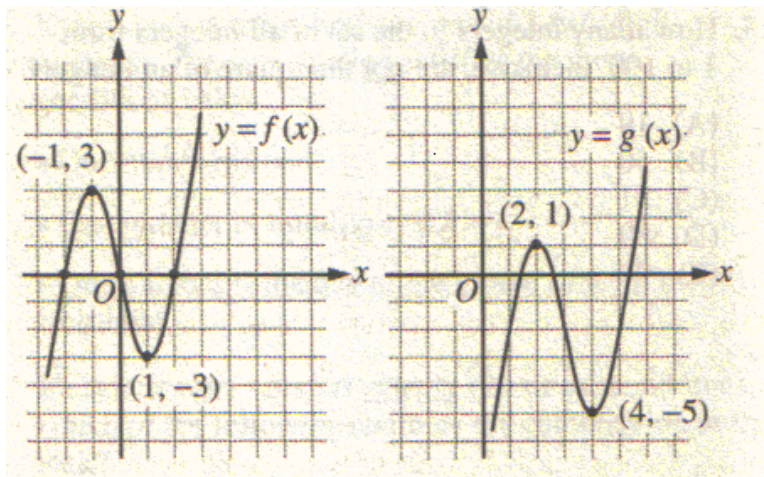


10. The total daily profit  $p$ , in dollars, from producing and selling  $x$  units of a certain product is given by the function  $p(x) = 17x - (10x + b)$ , where  $b$  is a constant. If 300 units were produced and sold yesterday for a total profit of \$1,900, what is the value of  $b$ ?
- (A) -200  
 (B) -100  
 (C) 0  
 (D) 100  
 (E) 200

11. Consider the equation  $h(t) = c - (d - 4t)^2$ :

At time  $t = 0$ , a ball was thrown upward from an initial height of 6 feet. Until the ball hit the ground, its height, in feet, after  $t$  seconds was given by the function  $h$  above, in which  $c$  and  $d$  are positive constants. If the ball reached its maximum height of 106 feet at time  $t = 2.5$ , what was the height, in feet, of the ball at time  $t = 1$ ?

- 12.



The figures above show the graphs of the functions  $f$  and  $g$ . The function  $f$  is defined by  $f(x) = x^3 - 4x$ . The function  $g$  is defined by  $g(x) = f(x + h) + k$ , where  $h$  and  $k$  are constants. What is the value of  $hk$ ?

- (A) -6  
 (B) -3  
 (C) -2  
 (D) 3  
 (E) 6

13. Luke purchased an automobile for \$5,000, and the value of the automobile decreases by 20 percent each year. The value, in dollars, of the automobile  $n$  years from the date of purchase is given by the function  $V$ , where  $V(n) = 5000\left(\frac{4}{5}\right)^n$ . How many years from the date of purchase will the value of the automobile be \$3,200 ?
- (A) One  
(B) Two  
(C) Three  
(D) Four  
(E) Five

14-15. 
$$g(n) = n^2 + n$$
$$h(n) = n^2 - n$$

$$g(5) - h(4) =$$

- (A) 0  
(B) 8  
(C) 10  
(D) 18  
(E) 32

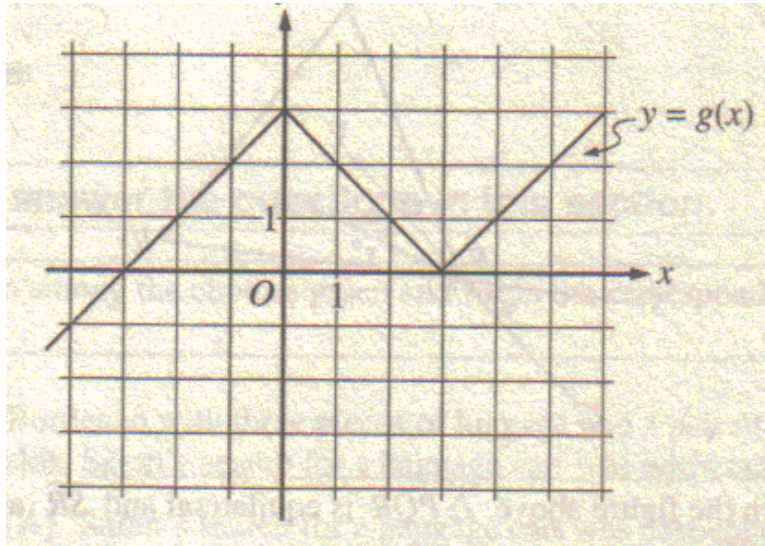
Which of the following is equivalent to  $h(m + 1)$  ?

- (A)  $g(m)$   
(B)  $g(m) + 1$   
(C)  $g(m) - 1$   
(D)  $h(m) + 1$   
(E)  $h(m) - 1$
16. Let the function  $f$  be defined by  $f(x) = x^2 + 18$ . If  $m$  is a positive number such that  $f(2m) = 2f(m)$ , what is the value of  $m$  ?

17. Let the function  $h$  be defined by  $h(t) = 2(t^3 - 3)$ . When  $h(t) = -60$ , what is the value of  $2 - 3t$  ?
- (A) 35  
(B) 11  
(C) 7  
(D) -7  
(E) -11
18. The cost of maintenance on an automobile increases each year by 10 percent, and Andrew paid \$300 this year for maintenance on his automobile. If the cost  $c$  for maintenance on Andrew's automobile  $n$  years from now is given by the function  $c(n) = 300x^n$ , what is the value of  $x$ ?
- (A) 0.1  
(B) 0.3  
(C) 1.1  
(D) 1.3  
(E) 30
19. Let the function  $f$  be defined by  $f(x) = 2x - 1$ . If  $\frac{1}{2}f(\sqrt{t}) = 4$ , what is the value of  $t$  ?
- (A)  $\frac{3}{\sqrt{2}}$   
(B)  $\frac{7}{2}$   
(C)  $\frac{9}{2}$   
(D)  $\frac{49}{4}$   
(E)  $\frac{81}{4}$

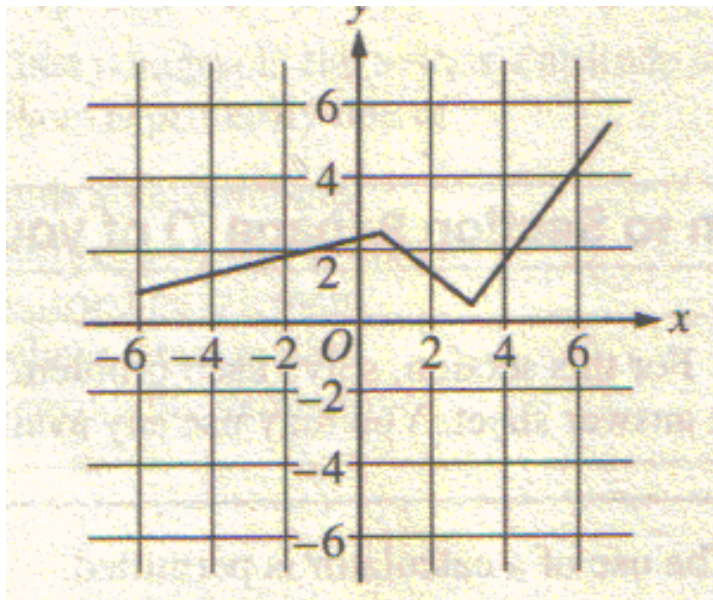


20.



The figure above shows the graph of  $y = g(x)$ . If the function  $h$  is defined by  $h(x) = g(2x) + 2$ , what is the value of  $h(1)$  ?

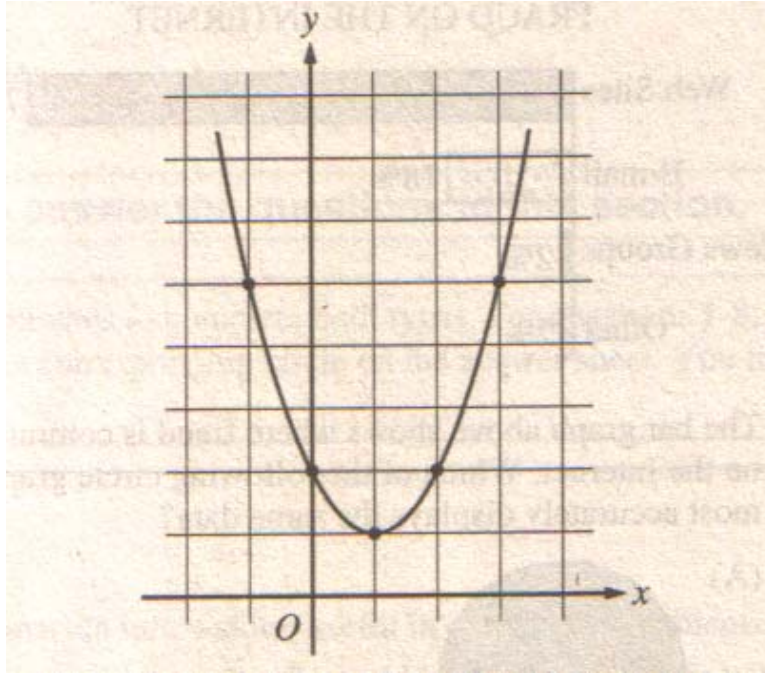
21.



The figure above shows the graph of the function  $h$ . Which of the following is closest to  $h(5)$  ?

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

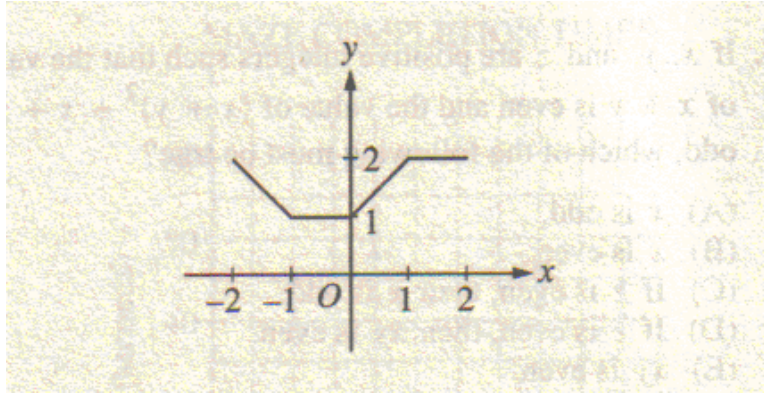
22.



The figure above shows the graph of the quadratic function  $f$  that has a minimum at one point  $(1,1)$ . If  $f(b) = f(3)$ , which of the following could be the value of  $b$ ?

- (A)  $-3$
- (B)  $-2$
- (C)  $-1$
- (D)  $1$
- (E)  $5$

23.



The graph of  $y = g(x)$  is shown above. If  $g(k) = 1$ , which of the following is a possible value of  $k$ ?

- (A)  $-1.5$
- (B)  $-0.5$
- (C)  $1$
- (D)  $1.5$
- (E)  $2$

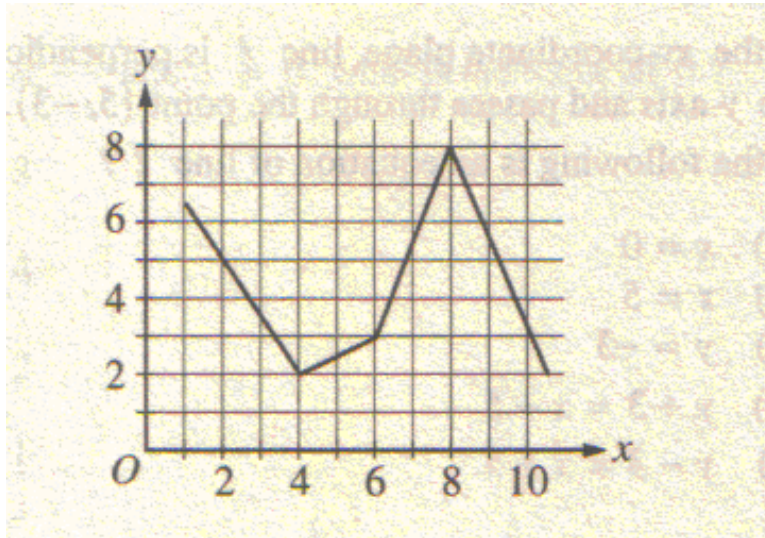
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$x$	0	1	2	3
$f(x)$	1	2	5	10

The table above gives values of the quadratic function  $f$  for selected values of  $x$ . Which of the following defines  $f$ ?

- (A)  $f(x) = x^2 + 1$
- (B)  $f(x) = x^2 + 2$
- (C)  $f(x) = 2x^2 - 2$
- (D)  $f(x) = 2x^2 - 1$
- (E)  $f(x) = 2x^2 + 1$

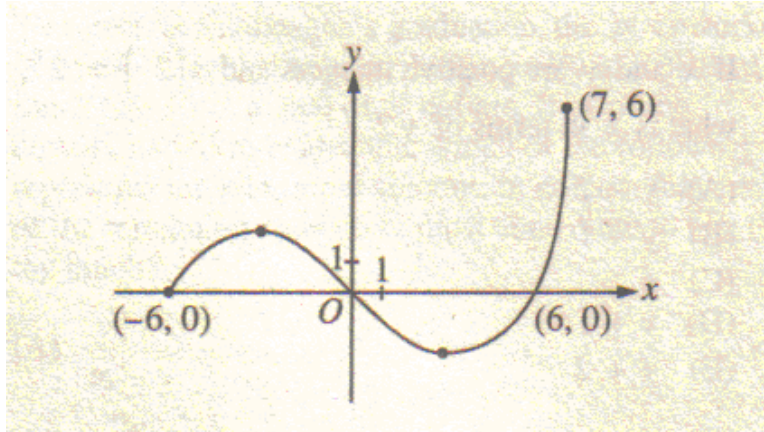
25.



The graph of  $y = g(x)$  is shown above. If  $g(2) = k$ , which of the following could be the value of  $g(k)$ ?

- (A) 2
  - (B) 2.5
  - (C) 3
  - (D) 3.5
  - (E) 5
26. In the  $xy$ -coordinate system,  $(\sqrt{6}, k)$  is one of the points of intersection of the graphs  $y = x^2 - 7$  and  $y = -x^2 + j$ , where  $j$  is a constant. What is the value of  $j$ ?
- (A) 5
  - (B) 4
  - (C) 3
  - (D) 2
  - (E) 1

27.



Based on the graph of the function  $f$  above, what are the values of  $x$  for which  $f(x)$  is negative?

- (A)  $-6 < x < 0$
  - (B)  $0 < x < 6$
  - (C)  $6 < x < 7$
  - (D)  $-6 < x < 6$
  - (E)  $-6 < x < 0$  and  $6 < x < 7$
28. The rate for a telephone call between City  $A$  and City  $B$  is 50 cents for the first minute and 30 cents for each additional minute or portion thereof. Which of the following functions describes the cost, in dollars, of a phone call between these two cities that lasts for  $n$  minutes, if  $n$  is a positive integer?
- (A)  $f(n) = 0.80n$
  - (B)  $f(n) = 0.50 + 0.30n$
  - (C)  $f(n) = 0.50 + 0.30(n + 1)$
  - (D)  $f(n) = 0.50 + 0.30(n - 1)$
  - (E)  $f(n) = 0.50n + 0.30(n - 1)$

29.

$x$	1	2	3	4
$y$	$\frac{(0)(2)}{3}$	$\frac{(1)(3)}{5}$	$\frac{(2)(4)}{7}$	$\frac{(3)(5)}{9}$

Of the following equations, which describes the relationship between  $x$  and  $y$  in the table above?

(A)  $y = \frac{2x - 2}{x + 2}$

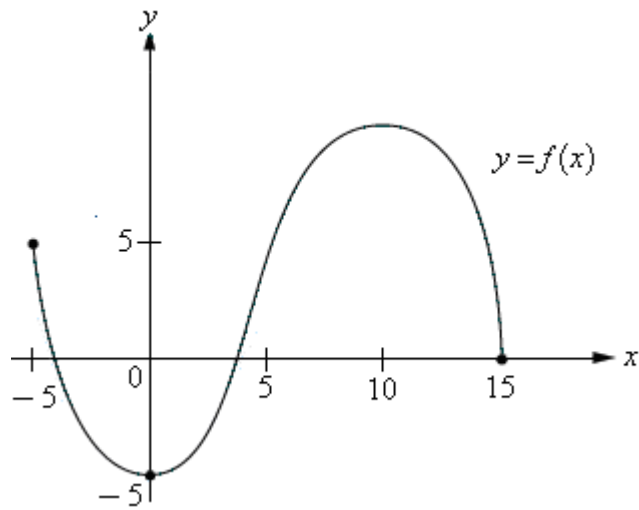
(B)  $y = \frac{2x - 1}{x + 3}$

(C)  $y = \frac{(x - 1)(x + 1)}{2x + 1}$

(D)  $y = \frac{(x - 1)(2x - 2)}{2x + 1}$

(E)  $y = \frac{2^x}{2x + 1}$

30.



The function  $f$  is graphed in the  $xy$ -plane above. If the function  $g$  is defined by  $g(x) = f(x) + 4$ , for how many values of  $x$  between  $-5$  and  $15$  does  $g(x)$  equal  $0$ ?

- (A) None
- (B) One
- (C) Two
- (D) Three
- (E) More than three