SATPREP

Assignment : *Parabola*

1. An archer shoots an arrow into the air such that its height at any time, t, is given by the function $h(t) = -16t^2 + kt + 3$. If the maximum height of the arrow occurs at 4 seconds after it is launched, what is the value of k?

   (A) 128
   (B) 64
   (C) 8
   (D) 4

2. A model rocket is launched vertically into the air such that its height at any time, t, is given by the function $h(t) = -16t^2 + 80t + 10$. What is the maximum height attained by the model rocket?

   (A) 140
   (B) 110
   (C) 85
   (D) 10

3. When a ball is thrown straight up at an initial velocity of 54 feet per second. The height of the ball t seconds after it is thrown is given by the function $h(t) = 54t - 12t^2$. How many seconds after the ball is thrown will it return to the ground?

   (A) 9.2
   (B) 6
   (C) 4.5
   (D) 4

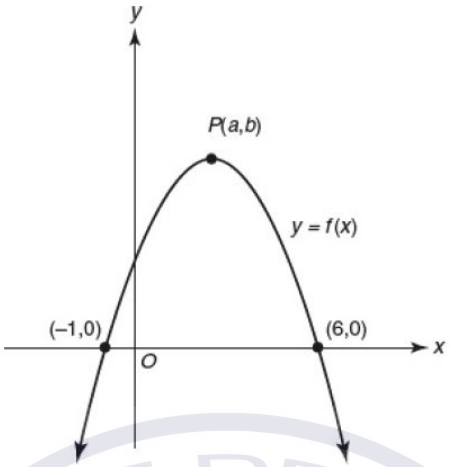
4. The graph of $y + 3 = (x - 4)^2 - 6$ is a parabola in the xy-plane. What are the x-intercepts of the parabola?

   (A) 1 and 7
   (B) −1 and −7
   (C) 4 and −6
   (D) 4 and −9

5. The graph of $y = (2x - 4)(x - 8)$ in the xy-plane is a parabola. Which of the following are true?

   I. The graph's line of symmetry is $x = 5$
   II. The minimum value of y is −7
   III. The y-intercept of the graph is 32

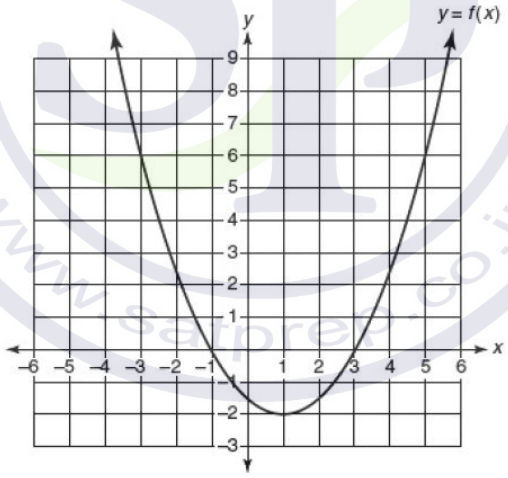
   (A) I and II only
   (B) I and III only
   (C) II and III only
   (D) I, II, and III



Note: Figure not drawn to scale

6. The graph of a quadratic function f is shown in the above figure. If $f(x) \leq b$ for all values of x, which of the following could be the coordinates of point P?

(A) (1.5, 2)
(B) (2.25, 3.5)
(C) (2.5, 4)
(D) (2.75, 5)



7. The figure above shows the graph of a quadratic function f with a minimum point at $(1, -2)$. If $f(5) = f(c)$, then which of the following could be the value of c?

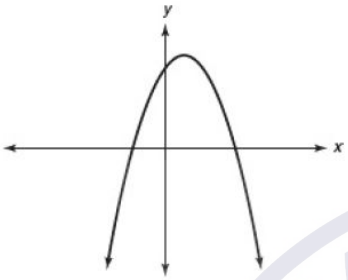
(A) −5
(B) −3
(C) 0
(D) 6

8. The graph of a quadratic function f intersects the x-axis at $x = -2$ and $x = 6$. If $f(8) = f(p)$, which could be the value of p?

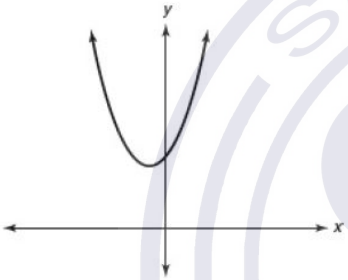
(A) −6
(B) −4
(C) −2
(D) 0

9. If in the quadratic function $f(x) = ax^2 + bx + c$, a and c are both negative constants, which of the following could be the graph of function f?

(A)



(B)



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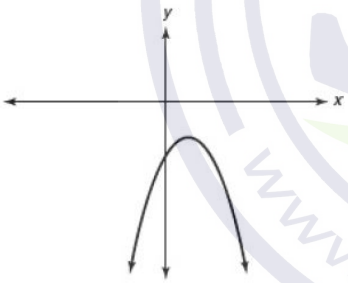

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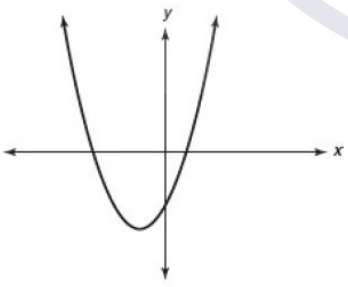
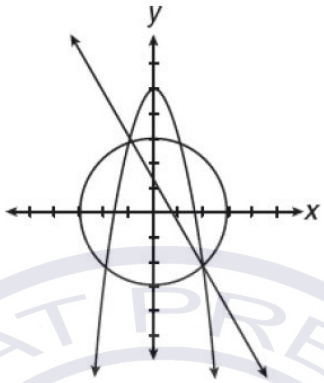


10. A parabola passes through the points (0, 0) and (6, 0). If the turning point of the parabola is $T(h, 4)$, which statement must be true?

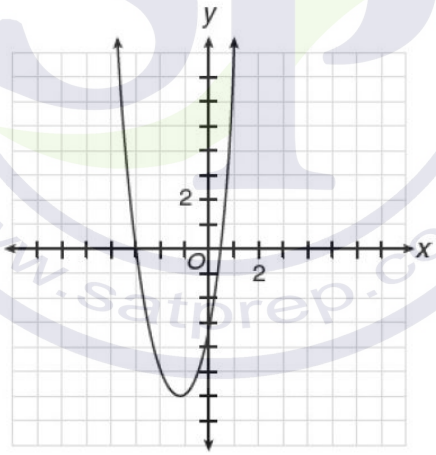
I. $h = 2$
II. If the parabola passes through (1, 2), then it must also pass through (5, 2)
III. Point T is the highest point of the parabola

(A) II only
(B) III only
(C) I and II only
(D) II and III only



11. A system of three equations whose graphs in the *xy*-plane are a line, a circle, and a parabola is shown above. How many solutions does the system have?

(A) 1
(B) 2
(C) 3
(D) 4



12. Which of the following could be the equation of the graph above?

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

$$y = 2x^2 - 12x + 11$$

13. The graph of the equation above is a parabola in the xy-plane. What is the distance between the vertex of the parabola and the point (3, 1)?

(A) 1
(B) 8
(C) 10
(D) 12

$$f(x) = ax^2 + bx + c,\ a > 0$$

14. The coordinates of the lowest point on the graph of the function defined by the equation above is (3, 2). If $f(-1) = p$, then which of the following represents the value of p?

(A) $f(-5)$
(B) $f(-4)$
(C) $f(6)$
(D) $f(7)$

15. The parabola whose equation is $y = ax^2 + bx + c$ passes through the points $(-3, -40)$, $(0, 29)$, and $(-1, 10)$. What is an equation of the line of symmetry?

(A) $x = \frac{17}{4}$
(B) $x = \frac{9}{2}$
(C) $x = 5$
(D) $x = 6$

$$x^2 + y^2 = 416$$
$$y + 5x = 0$$

16. If (x, y) is a solution to the system of equations above and $x > 0$, what is the value of the difference $x - y$?

(A) 4
(B) 16
(C) 20
(D) 24

$$h(t) = -4.9t^2 + 68.6t$$

17. The function above gives the height of a model rocket, in meters, t seconds after it is launched from ground level. What is the maximum height, to the *nearest meter*, attained by the model rocket?

(A) 90
(B) 120
(C) 180
(D) 240

$$y = k(x - 1)(x + 9)$$

18. The graph of the equation above is a parabola in the xy-plane. If $k > 0$, what is the minimum value of

y expressed in terms of k?

(A) $-7k$
(B) $-16k$
(C) $-25k$
(D) $-73k$

Grid-In

$$x^2 - y^2 = 18$$
$$y = x - 4$$

1. In the above system of equations, what is the value of $x + y$?

$$d(t) = -16t^2 + 40t + 24$$

2. A swimmer dives from a diving board that is 24 feet above the water. The distance, in feet, that the diver travels after t seconds have elapsed is given by the function above. What is the maximum height above the water, in feet, the swimmer reaches during the dive?

3. The marketing department at Sports Stuff found that approximately 600 pairs of running shoes will be sold monthly when the average price of each pair of running shoes is $90. It was observed that for each $5 reduction in price, an additional 50 pairs of running shoes will be sold monthly. What price per pair of running shoes will maximize the store's monthly revenue from the sale of running shoes?

Questions 4–6 refer to the equation below.

$$h(x) = -\frac{1}{225}x^2 + \frac{2}{3}x$$

The function h above models the path of a football when it is kicked during an attempt to make a field goal where x is the horizontal distance, in feet, from the kick, and $h(x)$ is the number of feet in the corresponding height of the football above the ground.

4. After the ball is kicked, what is the number of feet the football travels horizontally before it hits the ground?

5. What is the number of feet in the maximum height of the football?

6. The goal post is 10 feet high and a horizontal distance of 45 yards from the point at which the ball is kicked. By how many feet will the football fail to pass over the goal post?