Date Completed: _____
Mentor Initials: _____

Quadratics (Advanced)

Multiple Choice

1. Which of the following most accurately describes the roots of the equation $8x^2 + 5x - 3 = 0$?

A) One irrational double root
B) Two irrational roots
C) Two rational roots
D) Cannot be determined from the given information

2. If $r + s = 8$ and $r - s = 4$, what is the value of $(r + s)(r^2 - s^2)$?

A) 4
B) 32
C) 256
D) 512

3. $$y = -6t^2 + 24t + 30$$

The equation above gives the height of a football above the ground y, in feet, t seconds after it is released from a player's hand. How many seconds after it is thrown does the ball reach the ground?

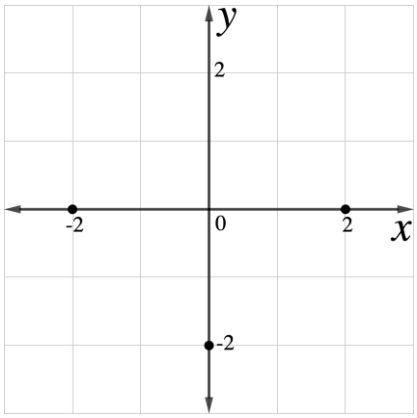
A) 0
B) 3
C) 5
D) 6

4. $$4(3x + 2)^2 + k = 1$$

If k is a constant, for what value of k will the quadratic equation above have exactly one solution?

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

5. Which of the following is an equation of a parabola that passes through the 3 points in the standard (x, y) coordinate plane below?



A) $y = 2(x + 2)^2$

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

C) $y = 2(x + 2)(x - 2)$

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

6. Which of the following functions has a minimum value of d, where d is a positive constant?

A) $g(x) = -dx^2$

B) $g(x) = dx^2$

C) $g(x) = x^2 + d$

D) $g(x) = (x + d)^2$

7. $$y = 3x^2 + 12x + 9$$

In which of the following equivalent forms of the above equation do the coordinates of the vertex of its graph in the xy-plane appear as constants or coefficients?

A) $y = 3(x + 3)(x + 1)$

B) $y = 3(x^2 + 4x + 3)$

C) $y + 3 = 3(x + 2)^2$

D) $\frac{1}{3}y + 4 = (x + 2)^2$

8. $2(x+3)^2 + k = 2$

If k is a constant, for what value of k will the quadratic equation above have no real solutions?

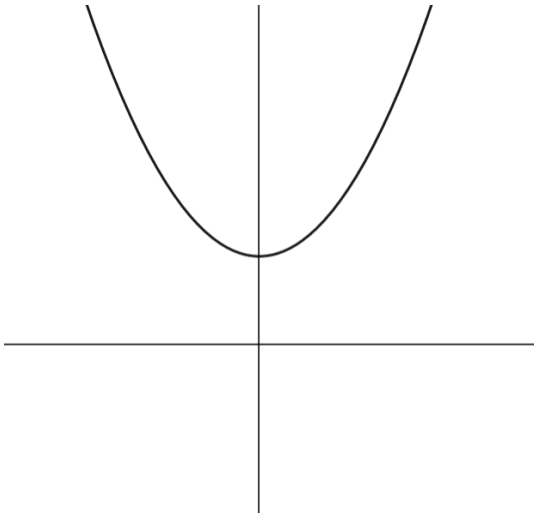
A) -3
B) 0
C) 1
D) 3

9. $y = (x-c)(x-d)$

In the equation above, c and d are constants and $c \neq d$. The graph of the equation in the xy-plane is a parabola. What must $\frac{c+d}{2}$ represent?

A) The x-coordinate of the vertex of the parabola
B) The y-coordinate of the vertex of the parabola
C) The x-coordinate of one o the roots of the equation
D) The$y$-coordinate of one of the roots of the equation

10.



The equation of the parabola in the xy-plane above is $y = ax^2 + c$ and the vertex is $(0, c)$. Which of the following is true about the parabola with the equation $y = -a(x-b)^2 + c$?

A) The vertex is (b, c) and the graph opens upward.
B) The vertex is (b, c) and the graph opens downward.
C) The vertex is $(-b, c)$ and the graph opens upward.
D) The vertex is $(-b, c)$ and the graph opens downward.

Grid In

11.

$$y = -(x + 3)^2 + k$$
$$y = 2$$

In the system of equations shown, k is a positive integer constant. For what value of k does the system have exactly zero solutions?

12. If the equation $x(x + 1) = 3$ has solutions in the form $\frac{a \pm \sqrt{b}}{2}$, what is the sum of $a + b$?

13. The total distance, d, in feet, 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 5.0 seconds, the total distance traveled by the object is 5.0 feet, and at a time of 15.0 seconds, the total distance traveled by the object is 45.0 feet. If the object was a distance of 0 feet when $t = 0$, then what is total distance traveled, in feet, by the object after 45 seconds?

14.

$$2x^2 - 8x + 13 = 0$$

If f and g are the two solutions of the quadratic equation above, what is the value of $f + g$?

15. A quadratic function can be used to model the height, in meters, of an object above the ground in terms of the time, in seconds, after the object was launched. According to the model, an object was launched into the air from a height of 0 meters and reached its maximum height of 441 meters 21 seconds after it was launched. Based on the model, after how many seconds did the object land back on the ground?