

Quadratics (Advanced)

1. You are given the following system of equations:

$$\begin{aligned}y &= x^2 \\ px + qy &= -z\end{aligned}$$

where p , q , and z are integers. For which of the following will there be more than one (x, y) solution, with real-number coordinates, for the system?

- A. $p^2 + 4qz > 0$
 - B. $q^2 - 4pz < 0$
 - C. $p^2 - 4qz > 0$
 - D. $q^2 + 4qz > 0$
 - E. $q^2 + 4pz < 0$
2. Which of the following are linear factors of $ghx^2 + (gn + hm)x + mn$, a general quadratic expression in x ?
- A. $(gx - m)(hx - n)$
 - B. $(gx - m)(hx + n)$
 - C. $(gx + m)(hx - n)$
 - D. $(gx + m)(hx + n)$
 - E. $(gx - n)(hx - m)$
3. Given that $x = 4$ is a solution to $x^2 + bx - 8 = 0$, which of the following polynomials is a factor of $x^2 + bx - 15$?
- A. $x - 3$
 - B. $x - 1$
 - C. $x + 3$
 - D. $x + 4$
 - E. $x + 5$
4. Given constants g , h , r , s such that $x^2 + rx + g$ has factors of $(x + 3)$ and $(x + 1)$, and $x^2 + sx + h$ has factors of $(x - 2)$ and $(x + 5)$, what is rs ?
- A. -30
 - B. -10
 - C. 3
 - D. 12
 - E. 24

5. Which of the following most accurately describes the roots of the equation $8x^2 + 5x - 3 = 0$?
- A. One rational double root
 - B. One irrational double root
 - C. Two irrational roots
 - D. Two rational roots
 - E. Cannot be determined from the given information
6. Which of the following quadratic equations has the complex number $1 + \sqrt{-1}$ as a solution?
- A. $x^2 + 1 = 0$
 - B. $x^2 + x + 1 = 0$
 - C. $x^2 - x + 1 = 0$
 - D. $x^2 - 2x + 1 = 0$
 - E. $x^2 - 2x + 2 = 0$
7. If $r + s = 8$ and $r - s = 4$, what is the value of $(r + s)(r^2 - s^2)$?
- A. 4
 - B. 16
 - C. 32
 - D. 256
 - E. 512
8. If $9x^2 + bx + 16 = 0$, where b is a constant, has exactly one solution, what is a possible value of b ?
- A. 3
 - B. 16
 - C. 24
 - D. 25
 - E. 144
9. In the xy -plane, the graph of $y = x^2 + bx + c$, where b and c are constants, has roots at $x = -5$ and $x = 6$. What is the value of b ?
- A. -30
 - B. -1
 - C. 1
 - D. 11
 - E. 30

$$x - 3\sqrt{x} - 4 = 0$$

10. What value of x satisfies the equation above?

- A. 4
- B. 8
- C. 16
- D. 25
- E. 36

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

11. 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
- E. 30

$$g(x) = x^3 + ax^2 + bx + c$$

12. The function g is defined above, where a , b , and c are integer constants. If the zeros of the function are -4 , 5 , and -7 , what is the value of c ?

- A. -140
- B. -1
- C. 1
- D. 140
- E. Cannot be determined from the given information

13. In the standard (x, y) coordinate plane, the graph of $y = 24(x + 12)^2 - 21$ is a parabola. What are the coordinates of the vertex of the parabola?

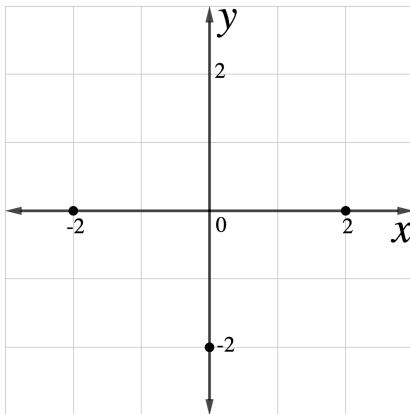
- A. $(24, -21)$
- B. $(24, 21)$
- C. $(12, -21)$
- D. $(-12, -21)$
- E. $(-12, 21)$

$$4(x + a) + 6(x^2 - a) = 6x^2 + 4x + 10$$

14. In the equation above, a is a constant. If the equation is true for all values of x , then what is the value of a ?

- A. -5
- B. -4
- C. 4
- D. 6
- E. 10

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

16. What are the solutions of the quadratic equation

$$(x - 3)^2 - 9 = 0?$$

- A. $x = -6$ and $x = 6$
- B. $x = 6$ and $x = 0$
- C. $x = 6$ and $x = 3$
- D. $x = 0$ and $x = 3$
- E. $x = -6$ and $x = 6$