QUADRATIC EQUATIONS

THE QUADRATIC FORMULA

If $ax^2 + bx + c = 0$ but $a \neq 0$

then
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

DISCRIMINANT

$\Rightarrow$ $b^2 - 4ac > 0$ __two__ real solutions

$\Rightarrow$ $b^2 - 4ac = 0$ __one__ real solutions

$\Rightarrow$ $b^2 - 4ac < 0$ __zero__ real solutions

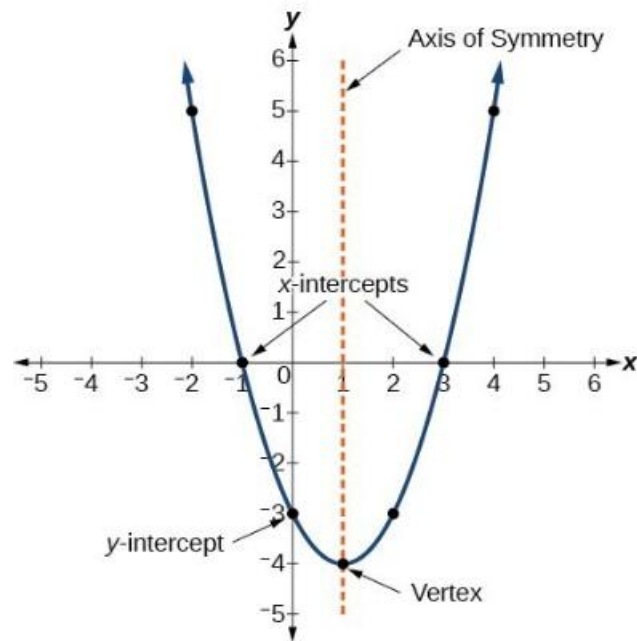**The Vertex Form of the Quadratic Equation:**

$$y = a(x - h)^2 + k$$

vertex (h, k)

where $h = \dfrac{-b}{2a}$ and evaluate y at h to find k.

The axis of symmetry:

The axis of symmetry of a parabola is a vertical line that divides the parabola into two symmetrical halves, like a mirror image.

Question 20

What are the solutions to $3x^2 + 12x + 6 = 0$?

A) $x = -2 \pm \sqrt{2}$

B) $x = -2 \pm \dfrac{\sqrt{30}}{3}$

C) $x = -6 \pm \sqrt{2}$

D) $x = -6 \pm 6\sqrt{2}$

Question 21

The function f is defined by $f(x) = (x + 3)(x + 1)$. The graph of f in the xy-plane is a parabola. Which of the following intervals contains the x-coordinate of the vertex of the graph of f ?

A) $-4 < x < -3$

B) $-3 < x < 1$

C) $1 < x < 3$

D) $3 < x < 4$

Question 22

$$5x^2 + 10x + 16 = 0$$

How many distinct real solutions does the given equation have?

A) Exactly one

B) Exactly two

C) Infinitely many

D) Zero

Question 23

$$x = 2y + 5$$

$$y = (2x - 3)(x + 9)$$

How many ordered pairs (x, y) satisfy the system of equations shown above?

A) 0

B) 1

C) 2

D) Infinitely many

Question 24

If $(ax + 2)(bx + 7) = 15x^2 + cx + 14$ for all values of x, and $a + b = 8$, what are the two possible values for c ?

A) 3 and 5
B) 6 and 35
C) 10 and 21
D) 31 and 41

Question 25

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

In the equation above, a is a constant. The graph of the equation in the xy-plane is a parabola. Which of the following is true about the parabola?

A) Its minimum occurs at $(-3, a)$.

B) Its minimum occurs at $(3, a)$.

C) Its maximum occurs at $(-3, a)$.

D) Its maximum occurs at $(3, a)$.

Question 26

$$f(x) = (x+6)(x-4)$$

Which of the following is an equivalent form of the function f above in which the minimum value of f appears as a constant or coefficient?

A) $f(x) = x^2 - 24$

B) $f(x) = x^2 + 2x - 24$

C) $f(x) = (x-1)^2 - 21$

D) $f(x) = (x+1)^2 - 25$

$$y = 2x^2 - 21x + 64$$
$$y = 3x + a$$

In the given system of equations, a is a constant. The graphs of the equations in the given system intersect at exactly one point, (x, y), in the xy-plane. What is the value of x ?

A) −8

B) −6

C) 6

D) 8