

# Lesson 9-9

Objective - To use the discriminant to determine the number of real solutions for a quadratic.

Quadratic Formula

Discriminant

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

Used to find the roots of a quadratic equation...

$$y = ax^2 + bx + c$$

or

$$0 = ax^2 + bx + c$$

Used to find the number of roots.

$$b^2 - 4ac > 0 \quad \text{Two real roots}$$

$$b^2 - 4ac = 0 \quad \text{One real root}$$

$$b^2 - 4ac < 0 \quad \text{No real roots}$$

Determine the number of roots for the quadratic equation below.

$$y = 2x^2 - 5x + 3$$

$$\begin{aligned} a &= 2 \\ b &= -5 \\ c &= 3 \end{aligned}$$

$$b^2 - 4ac > 0$$

$$(-5)^2 - 4(2)(3)$$

$$25 - 24 = 1$$

Two Real Solutions

Determine the number of x-intercepts for the quadratic equation below.

$$y = -x^2 + 4x - 7$$

$$\begin{aligned} a &= -1 \\ b &= 4 \\ c &= -7 \end{aligned}$$

$$b^2 - 4ac < 0$$

$$(4)^2 - 4(-1)(-7)$$

$$16 - 28 = -12$$

No Real Solution

Determine the number of x-intercepts for the quadratic equation below.

$$y = x^2 - 6x + 9$$

$$\begin{aligned} a &= 1 \\ b &= -6 \\ c &= 9 \end{aligned}$$

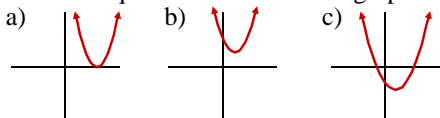
$$b^2 - 4ac = 0$$

$$(-6)^2 - 4(1)(9)$$

$$36 - 36 = 0$$

One Real Solution

Match each equation below with its graph.



b 1)  $y = 2x^2 - x + 1$

$$\begin{aligned} b^2 - 4ac \\ (-1)^2 - 4(2)(1) \\ 1 - 8 = -7 \end{aligned} \quad \text{No Real Roots}$$

c 2)  $y = x^2 - x - 2$

$$\begin{aligned} b^2 - 4ac \\ (-1)^2 - 4(1)(-2) \\ 1 + 8 = 9 \end{aligned} \quad \text{Two Real Roots}$$

a 3)  $y = x^2 - 2x + 1$

$$\begin{aligned} b^2 - 4ac \\ (-2)^2 - 4(1)(1) \\ 4 - 4 = 0 \end{aligned} \quad \text{One Real Root}$$

Tell whether the vertex lies above, below, or on the x-axis.

1)  $y = 3x^2 - 2x + 4$

Opens up

$$b^2 - 4ac$$

$$(-2)^2 - 4(3)(4)$$

$$4 - 48 = -44$$

No Real Roots



2)  $y = -x^2 + 5x + 1$

Opens down

$$b^2 - 4ac$$

$$(5)^2 - 4(-1)(1)$$

$$25 + 4 = 29$$

Two Real Roots



