

Pre-Calculus 11  
Chapter 4 ~ Quadratic Equations

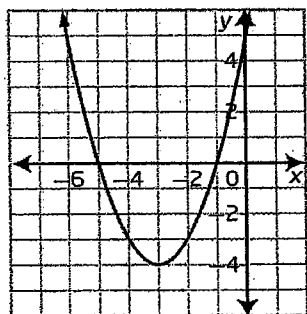
Lesson 4.1 ~ Graphical Solutions of Quadratic Equations

**Quadratic Function**  $\rightarrow f(x) = ax^2 + bx + c$       **Quadratic Equation**  $\rightarrow ax^2 + bx + c = 0$

When we graph a quadratic function, it typically intersects the  $x$ -axis. These  $x$ -intercepts are called the **zeros** of the function and the **roots** of the corresponding equation.

When asked to **solve** a quadratic equation, we are looking for the possible values of  $x$  that will satisfy the equation (make  $y = 0$ ). There are many methods that can be used; we will start by graphing to find the solutions, and then we will use three different algebraic methods.

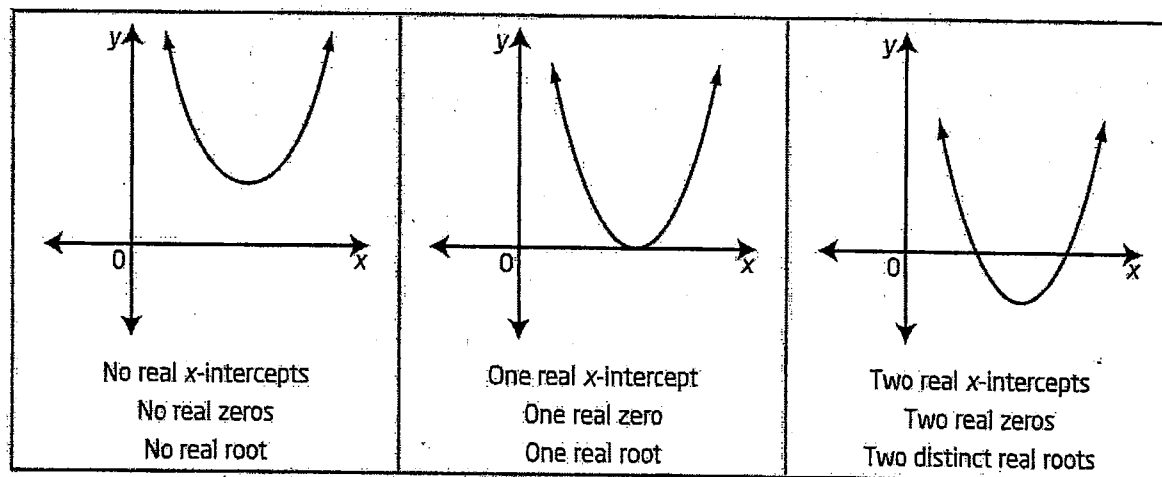
Example #1: The quadratic function  $f(x) = x^2 + 6x + 5$  has been graphed below. It has  $x$ -intercepts at  $(-5, 0)$  and  $(-1, 0)$ . Therefore the solutions are  $x = -5$  and  $x = -1$ , since the result of substituting the values of  $-5$  and  $-1$  into the equation would result in a  $y$  value that is zero.



$$\begin{aligned} y &= (-5)^2 + 6(-5) + 5 \\ y &= 25 - 30 + 5 \\ y &= 0 \end{aligned}$$

$$\begin{aligned} y &= (-1)^2 + 6(-1) + 5 \\ y &= 1 - 6 + 5 \\ y &= 0 \end{aligned}$$

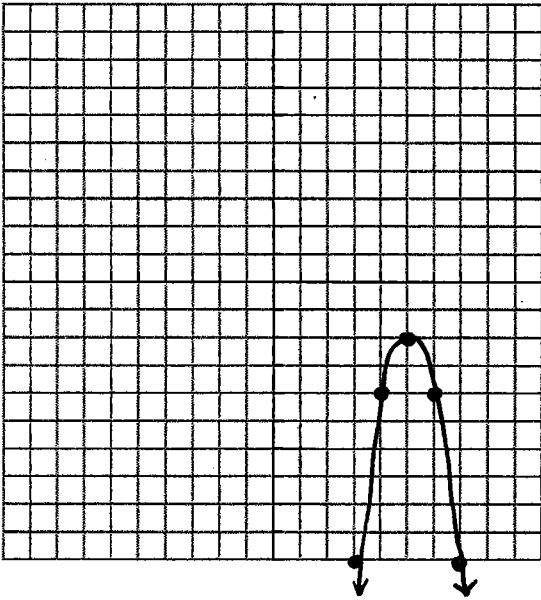
Number of Solutions: There are three possible scenarios for the number of solutions.



Example #2: Solve each quadratic equation by graphing.

a)  $-2(x - 5)^2 - 2 = 0$

→ no solution  
(doesn't cross  
x-axis)



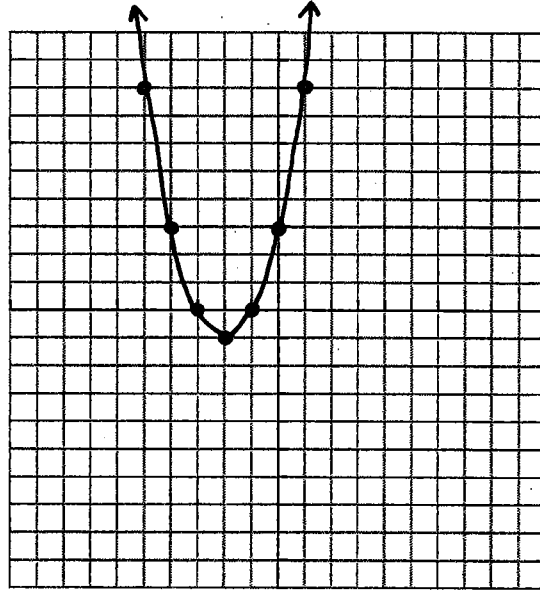
b)  $x^2 + 4x = -3$

$$x^2 + 4x + 3 = 0$$

$$x^2 + 4x + 4 - 4 + 3 = 0$$

$$(x + 2)^2 - 1 = 0$$

→  $x = -3, -1$



Example #3: The manager of Isabelle's Fine Fashions is investigating the effect that raising or lowering dress prices has on the daily revenue from dress sales. The function  $R(x) = 100 + 15x - x^2$  gives the store's revenue,  $R$ , in dollars, from dress sales, where  $x$  is the price change, in dollars. What price changes will result in no revenue?

• no revenue →  $R = 0$

$$\hookrightarrow 0 = 100 + 15x - x^2$$

• use graphing calculator to find x-intercepts:

$$\hookrightarrow x = -5, 20$$

\* Lower price \$5 or raise price \$20  
to have no revenue