

## Section 5.5

# Solving Quadratic Equations Using Square Roots

Another way to solve quadratic equations is to take the square root of both sides of the equation and then, if needed, to solve the resulting equation(s). You must be able to write the equation in the form  $(x - a)^2 = b$  to use this method.

Note that if  $x^2 = a^2$ ,  $x = \pm a$ , so if  $x^2 = 36$ , we'll have two answers,  $x = 6$  and  $x = -6$ .

**Example 1:** Solve by taking the square root of both sides of the equation:  $x^2 = 144$

Solution:

In this example, we'll take the square root of both sides of the equation, and we'll immediately find our two answers:

$$x^2 = 144$$

$$x = \pm 12$$

The two answers are  $x = 12$  and  $x = -12$ .

**Example 2:** Solve by taking the square root of both sides of the equation:  $4x^2 = 81$

Solution:

First, we'll isolate the  $x^2$ , then we'll take the square root of both sides to arrive at the final answer:

$$4x^2 = 81$$

$$x^2 = \frac{81}{4}$$

$$x = \pm \frac{9}{2}$$

The two answers are  $x = \frac{9}{2}$  and  $x = \frac{-9}{2}$ .

Note that the first two examples could also have been solved by factoring.

**Example 3:** Solve by taking the square root of both sides of the equation:  $(x - 2)^2 = 3$

Solution:

We'll start by taking the square root of both sides of the equation. Then we'll solve the resulting equation to find our two answers.

$$(x-2)^2 = 3$$

$$x-2 = \pm\sqrt{3}$$

$$x = 2 \pm \sqrt{3}$$

The answers to the problem are  $2 + \sqrt{3}$  and  $2 - \sqrt{3}$

**Example 4:** Solve by taking the square root of both sides of the equation:

$$9(x+6)^2 - 64 = 0$$

Solution:

We'll isolate  $(x+6)^2$  first, then take the square root of both sides of the equation:

$$9(x+6)^2 - 64 = 0$$

$$9(x+6)^2 = 64$$

$$(x+6)^2 = \frac{64}{9}$$

$$x+6 = \pm\frac{8}{3}$$

$$x = -6 \pm \frac{8}{3}$$

$$x = -6 + \frac{8}{3} \text{ or } x = -6 - \frac{8}{3}$$

$$x = \frac{-18}{3} + \frac{8}{3} \text{ or } x = \frac{-18}{3} - \frac{8}{3}$$

$$x = \frac{-10}{3} \text{ or } x = \frac{-26}{3}$$

The two answers to the problem are  $x = \frac{-10}{3}$  and  $x = \frac{-26}{3}$