10.3 Solve Quadratic Equations by Graphing

TEKS A.9.D, A.10.A, A.10.B; 2A.8.D

Before You solved quadratic equations by factoring.

Now You will solve quadratic equations by graphing.

Why? So you can solve a problem about sports, as in Example 6.

Key Vocabulary
- **quadratic equation**
- ***x*-intercept,** *p. 225*
- **roots,** *p. 575*
- **zero of a function,** *p. 337*

A **quadratic equation** is an equation that can be written in the **standard form** $ax^2 + bx + c = 0$ where $a \neq 0$.

In Chapter 9, you used factoring to solve a quadratic equation. You can also use graphing to solve a quadratic equation. Notice that the solutions of the equation $ax^2 + bx + c = 0$ are the x-intercepts of the graph of the related function $y = ax^2 + bx + c$.

Solve by Factoring

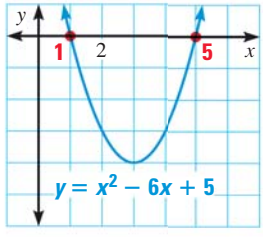
$x^2 - 6x + 5 = 0$

$(x - 1)(x - 5) = 0$

$x = 1$ *or* $x = 5$

Solve by Graphing

To solve $x^2 - 6x + 5 = 0$, graph $y = x^2 - 6x + 5$. From the graph you can see that the x-intercepts are 1 and 5.



READING
In this course, *solutions* refers to real-number solutions.

To solve a quadratic equation by graphing, first write the equation in standard form, $ax^2 + bx + c = 0$. Then graph the related function $y = ax^2 + bx + c$. The x-intercepts of the graph are the solutions, or roots, of $ax^2 + bx + c = 0$.

EXAMPLE 1 Solve a quadratic equation having two solutions

Solve $x^2 - 2x = 3$ by graphing.

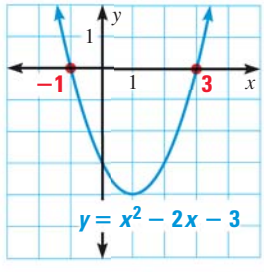
Solution

STEP 1 **Write** the equation in standard form.

$x^2 - 2x = 3$ **Write original equation.**

$x^2 - 2x - 3 = 0$ **Subtract 3 from each side.**

STEP 2 **Graph** the function $y = x^2 - 2x - 3$. The x-intercepts are -1 and 3.



▶ The solutions of the equation $x^2 - 2x = 3$ are -1 and 3.

CHECK You can check -1 and 3 in the original equation.

$x^2 - 2x = 3$ $\quad$ $x^2 - 2x = 3$ **Write original equation.**

$(-1)^2 - 2(-1) \stackrel{?}{=} 3$ $\quad$ $(3)^2 - 2(3) \stackrel{?}{=} 3$ **Substitute for *x*.**

$3 = 3$ ✓ $\quad$ $3 = 3$ ✓ **Simplify. Each solution checks.**