

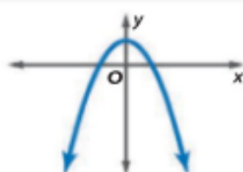
- Get in groups of 3
- Answer the six questions on a piece of notebook paper (everyone needs their own copy)

**NO CALCULATORS!**  
**SHOW ALL WORK!**

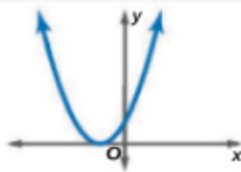
20 minutes to complete

**1 Solve by Graphing** A quadratic equation can be written in the standard form  $ax^2 + bx + c = 0$ , where  $a \neq 0$ . To write a quadratic function as an equation, replace  $y$  or  $f(x)$  with 0. Recall that the solutions or roots of an equation can be identified by finding the  $x$ -intercepts of the related graph. Quadratic equations may have two, one, or no real solutions.

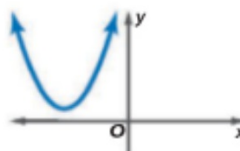
**KeyConcept** Solutions of Quadratic Equations



*two unique real solutions*



*one unique real solution*



*no real solutions*

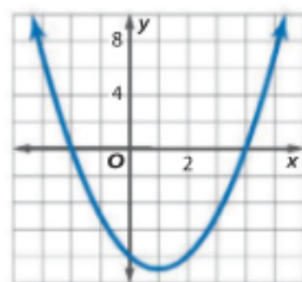


**Example 1** Two Roots

Solve  $x^2 - 2x - 8 = 0$  by graphing.

Graph the related function  $f(x) = x^2 - 2x - 8$ .

The  $x$ -intercepts of the graph appear to be at  $-2$  and  $4$ , so the solutions are  $-2$  and  $4$ .



**CHECK** Check each solution in the original equation.

$$\begin{array}{ll} x^2 - 2x - 8 = 0 & \text{Original equation} \\ (-2)^2 - 2(-2) - 8 \stackrel{?}{=} 0 & x = -2 \text{ or } x = 4 \\ 0 = 0 \checkmark & \text{Simplify.} \end{array}$$

$$\begin{array}{ll} x^2 - 2x - 8 = 0 & \\ (4)^2 - 2(4) - 8 \stackrel{?}{=} 0 & \\ 0 = 0 \checkmark & \end{array}$$

**1A–1B.** See Ch. 9 Answer Appendix for graphs.

**Guided Practice** Solve each equation by graphing.

**1A.**  $-x^2 - 3x + 18 = 0$

**1B.**  $x^2 - 4x + 3 = 0$

The solutions in Example 1 were two distinct numbers. Sometimes the two roots are the same number, called a **double root**.

### Example 2 Double Root

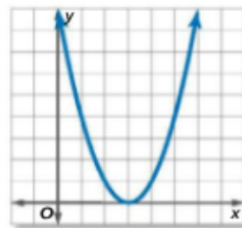
Solve  $x^2 - 6x = -9$  by graphing.

**Step 1** Rewrite the equation in standard form.

$$\begin{array}{ll} x^2 - 6x = -9 & \text{Original equation} \\ x^2 - 6x + 9 = 0 & \text{Add 9 to each side.} \end{array}$$

**Step 2** Graph the related function  
 $f(x) = x^2 - 6x + 9$ .

**Step 3** Locate the  $x$ -intercepts of the graph. Notice that the vertex of the parabola is the only  $x$ -intercept. Therefore, there is only one solution, 3.



**CHECK** Solve by factoring.

$$\begin{array}{ll} x^2 - 6x + 9 = 0 & \text{Original equation} \\ (x - 3)(x - 3) = 0 & \text{Factor.} \\ x - 3 = 0 \quad \text{or} \quad x - 3 = 0 & \text{Zero Product Property} \\ x = 3 \quad \quad \quad x = 3 & \text{Add 3 to each side.} \end{array}$$

The only solution is 3.

### Guided Practice

Solve each equation by graphing. **2A–2B. See Ch. 9 Answer Appendix for graphs.**

**2A.**  $x^2 + 25 = 10x$

**2B.**  $x^2 = -8x - 16$

Sometimes the roots are not real numbers. Quadratic equations with solutions that are not real numbers lead us to extend the number system to allow for solutions of these equations. These numbers are called *complex numbers*. You will study complex numbers in Algebra 2.

### Example 3 No Real Roots

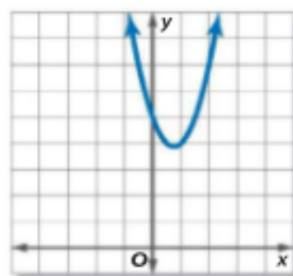


Solve  $2x^2 - 3x + 5 = 0$  by graphing.

**Step 1** Rewrite the equation in standard form.  
This equation is written in standard form.

**Step 2** Graph the related function  
 $f(x) = 2x^2 - 3x + 5$ .

**Step 3** Locate the  $x$ -intercepts of the graph. This graph has no  $x$ -intercepts. Therefore, this equation has no real number solutions. The solution set is  $\emptyset$ .



### Guided Practice

Solve each equation by graphing. **3A–3B. See Ch. 9 Answer Appendix for graphs.**

**3A.**  $-x^2 - 3x = 5$

**3B.**  $-2x^2 - 8 = 6x$



