

# 4-5 Reteaching

## Quadratic Equations

There are several ways to solve quadratic equations. If you can factor the quadratic expression in a quadratic equation written in standard form, you can use the Zero-Product Property.

**If  $ab = 0$  then  $a = 0$  or  $b = 0$ .**

### Problem

What are the solutions of the quadratic equation  $2x^2 + x = 15$ ?

$$2x^2 + x = 15 \quad \text{Write the equation.}$$

$$2x^2 + x - 15 = 0 \quad \text{Rewrite in standard form, } ax^2 + bx + c = 0.$$

$$(2x - 5)(x + 3) = 0 \quad \text{Factor the quadratic expression (the nonzero side).}$$

$$2x - 5 = 0 \quad \text{or} \quad x + 3 = 0 \quad \text{Use the Zero-Product Property.}$$

$$2x = 5 \quad \text{or} \quad x = -3 \quad \text{Solve for } x.$$

$$x = \frac{5}{2} \quad \text{or} \quad x = -3$$

Check the solutions:

$$x = \frac{5}{2}: 2\left(\frac{5}{2}\right)^2 + \left(\frac{5}{2}\right) \stackrel{?}{=} 15$$

$$x = -3: 2(-3)^2 + (-3) \stackrel{?}{=} 15$$

$$\frac{25}{2} + \frac{5}{2} \stackrel{?}{=} 15$$

$$18 - 3 \stackrel{?}{=} 15$$

$$15 = 15$$

$$15 = 15$$

Both solutions check. The solutions are  $x = \frac{5}{2}$  and  $x = -3$ .

## Exercises

Solve each equation by factoring. Check your answers.

1.  $x^2 - 10x + 16 = 0$

2.  $x^2 + 2x = 63$

3.  $x^2 + 9x = 22$

4.  $x^2 - 24x + 144 = 0$

5.  $2x^2 = 7x + 4$

6.  $2x^2 = -5x + 12$

7.  $x^2 - 7x = -12$

8.  $2x^2 + 10x = 0$

9.  $x^2 + x = 2$

10.  $3x^2 - 5x + 2 = 0$

11.  $x^2 = -5x - 6$

12.  $x^2 + x = 20$

# 4-5 **Reteaching** (continued)

## Quadratic Equations

Some quadratic equations are difficult or impossible to solve by factoring. You can use a graphing calculator to find the points where the graph of a function intersects the  $x$ -axis. At these points  $f(x) = 0$ , so  $x$  is a zero of the function.

**The values  $r_1$  and  $r_2$  are the zeros of the function  $y = (x - r_1)(x - r_2)$ . The graph of the function intersects the  $x$ -axis at  $x = r_1$ , or  $(r_1, 0)$ , and  $x = r_2$ , or  $(r_2, 0)$ .**

### Problem

What are the solutions of the quadratic equation  $3x^2 = 2x + 7$ ?

**Step 1** Rewrite the equation in standard form,  $ax^2 + bx + c = 0$ .  
 $3x^2 - 2x - 7 = 0$

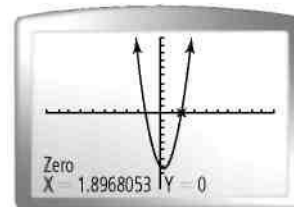
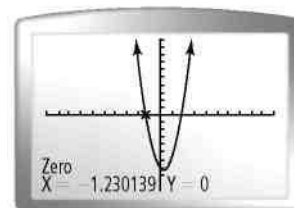
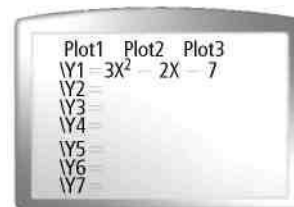
**Step 2** Enter the equation as Y1 in your calculator.

**Step 3** Graph Y1. Choose the standard window and see if the zeros of the function Y1 are visible on the screen. If they are not visible, zoom out and determine a better viewing window. In this case, the zeros are visible in the standard window.

**Step 4** Use the ZERO option in the CALC feature. For the first zero, choose bounds of  $-2$  and  $-1$  and a guess of  $-1.5$ . The screen display gives the first zero as  $x = -1.230139$ .

Similarly, the screen display gives the second zero as  $x = 1.8968053$ .

The solutions to two decimal places are  $x = -1.23$  and  $x = 1.90$ .



## Exercises

Solve the equation by graphing. Give each answer to at most two decimal places.

13.  $x^2 = 5$

14.  $x^2 = 5x + 1$

15.  $x^2 + 7x = 3$

16.  $x^2 + x = 5$

17.  $x^2 + 3x + 1 = 0$

18.  $x^2 = 2x + 4$

19.  $3x^2 - 5x + 9 = 8$

20.  $4 = 2x^2 + 3x$

21.  $x^2 - 6x = -7$

22.  $-x^2 = 8x + 8$