

**Practice with Examples**

For use with pages 291–298

**GOAL****Solve quadratic equations using the quadratic formula****VOCABULARY**The **quadratic formula**,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a},$$

is used to find the solutions of the quadratic equation  $ax^2 + bx + c = 0$ , when  $a \neq 0$ .

The expression  $b^2 - 4ac$ , where  $a$ ,  $b$ , and  $c$  are coefficients of the quadratic equation  $ax^2 + bx + c = 0$ , is called the **discriminant**.

If  $b^2 - 4ac > 0$ , then the equation has two real solutions.

If  $b^2 - 4ac = 0$ , then the equation has one real solution.

If  $b^2 - 4ac < 0$ , then the equation has two imaginary solutions.

**EXAMPLE 1****Solving a Quadratic Equation with Two Real Solutions**Solve  $-8x^2 - 5x = -x^2 - 1$ .**SOLUTION**

$$-8x^2 - 5x = -x^2 - 1$$

Write original equation.

$$-7x^2 - 5x + 1 = 0$$

Write in standard form.

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(-7)(1)}}{2(-7)}$$

Quadratic formula with  $a = -7$ ,  
 $b = -5$ , and  $c = 1$ .

$$x = \frac{5 \pm \sqrt{53}}{-14}$$

Simplify.

The solutions are

$$x = \frac{5 + \sqrt{53}}{-14} \approx -0.88 \quad \text{and} \quad x = \frac{5 - \sqrt{53}}{-14} \approx 0.16.$$

**Exercises for Example 1****Use the quadratic formula to solve the equation.**

1.  $x^2 - 9x + 5 = 0$

2.  $5x^2 + 3x - 1 = 0$

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

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### EXAMPLE 2 Solving a Quadratic Equation with One Real Solution

Solve  $2x^2 - 5x + 7 = x^2 - 3x + 6$ .

**SOLUTION**

$$2x^2 - 5x + 7 = x^2 - 3x + 6$$

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

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(1)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{0}}{2}$$

$$x = 1$$

Write original equation.

Write in standard form.

Quadratic formula with  $a = 1$ ,  
 $b = -2$ , and  $c = 1$ .

Simplify.

Simplify.

The solution is 1.

### Exercises for Example 2

Use the quadratic formula to solve the equation.

4.  $x^2 - 6x + 9 = 0$

5.  $x^2 + 4x + 4 = 0$

6.  $x^2 + 10x + 25 = 0$

LESSON  
**5.6**  
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### EXAMPLE 3 Solving a Quadratic Equation with Two Imaginary Solutions

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

#### SOLUTION

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

Write original equation.

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4(3)(5)}}{2(3)}$$

Quadratic formula with  $a = 3$ ,  
 $b = -3$ , and  $c = 5$ .

$$x = \frac{3 \pm \sqrt{-51}}{6}$$

Simplify.

$$x = \frac{3 \pm i\sqrt{51}}{6}$$

Write using the imaginary unit  $i$ .

The solutions are  $\frac{1}{2} + \frac{\sqrt{51}}{6}i$  and  $\frac{1}{2} - \frac{\sqrt{51}}{6}i$ .

#### Exercises for Example 3

Use the quadratic formula to solve the equation.

7.  $x^2 - 6x = -10$

8.  $x^2 = -x - 1$

9.  $x^2 - 2x + 3 = 0$