Name _____ Date _____

LESSON 9.6

Study Guide

For use with the lesson "Solve Quadratic Equations by the Quadratic Formula"

GOAL **Solve quadratic equations using the quadratic formula.**

Vocabulary

By completing the square for the quadratic equation $ax^2 + bx + c = 0$, you can develop a formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, that gives the solutions of any quadratic equation in standard form. This formula is called the **quadratic formula.**

EXAMPLE 1 Solve a quadratic equation

Solve $5x^2 - 3 = 4x$.

Solution

$5x^2 - 3 = 4x$	Write original equation.
$5x^2 - 4x - 3 = 0$	Write in standard form.
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	Quadratic formula
$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(5)(-3)}}{2(5)}$	Substitute values in the quadratic formula: $a = 5$, $b = -4$, and $c = -3$.
$= \frac{4 \pm \sqrt{76}}{10}$	Simplify.

The solutions are $\frac{4 + \sqrt{76}}{10} \approx 1.27$ and $\frac{4 - \sqrt{76}}{10} \approx -0.47$.

Exercises for Example 1

Use the quadratic formula to solve the equation. Round your solutions to the nearest hundredth, if necessary.

1. $x^2 - 12x - 14 = 0$
2. $5y^2 - 7 = 11y$
3. $9z^2 + 3z = 5$

LESSON 9.6

Study Guide *continued*

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EXAMPLE 2 Use the quadratic formula

Retirement Savings For the period 1995–2005, the amount of dollars invested in an individual's retirement account can be modeled by the function $y = 30x^2 - 24x + 15{,}500$ where x is the number of years since 1995. In what year was \$17,000 invested?

Solution

$y = 30x^2 - 24x + 15{,}500$ Write function.

$17{,}000 = 30x^2 - 24x + 15{,}500$ Substitute 17,000 for y.

$0 = 30x^2 - 24x - 1500$ Write in standard form.

$x = \dfrac{-(-24) \pm \sqrt{(-24)^2 - 4(30)(-1500)}}{2(30)}$ Substitute values in the quadratic formula: $a = 30$, $b = -24$, and $c = -1500$.

$= \dfrac{24 \pm \sqrt{180{,}576}}{60}$ Simplify.

The solutions are $\dfrac{24 + \sqrt{180{,}576}}{60} \approx 7$ and $\dfrac{24 - \sqrt{180{,}576}}{60} \approx -7$.

The year when \$17,000 is invested is about 7 years after 1995, or 2002.

EXAMPLE 3 Choose a solution method

Tell what method you would use to solve the quadratic equation. *Explain* your choice(s).

a. $3x^2 + 13x = 11$ **b.** $x^2 + 8x = 7$ **c.** $4x^2 - 25 = 0$

Solution

a. The quadratic equation cannot be factored easily, and completing the square will result in many fractions. So, the equation can be solved using the quadratic formula.

b. The quadratic equation can be solved by completing the square because the equation can be rewritten in the form $ax^2 + bx + c = 0$ where $a = 1$ and b is an even number.

c. The quadratic equation can be solved using square roots because the equation can be written in the form $x^2 = d$.

Exercises for Examples 2 and 3

4. In Example 2, find the year when \$18,000 was invested.

Tell what method you would use to solve the quadratic equation. *Explain* your choice(s).

5. $x^2 + 11x = 0$ **6.** $-3x^2 + 19x = -7$ **7.** $4x^2 + 16x = 12$