

3.1**Reteach**

A **quadratic equation in one variable** is an equation that can be written in the standard form

$ax^2 + bx + c = 0$, where a , b , and c are real numbers and $a \neq 0$. A **root of an equation** is a solution of the equation. You can use various methods to solve quadratic equations.

Key Idea**Solving Quadratic Equations**

Using square roots Write the equation in the form $u^2 = d$, where u is an algebraic expression, and solve by taking the square root of each side.

By factoring Write the quadratic equation $ax^2 + bx + c = 0$ in factored form and solve using the Zero-Product Property.

EXAMPLE Solving a Quadratic Equation Using Square Roots

Solve $x^2 - 23 = 5$ using square roots.

SOLUTION

$$x^2 - 23 = 5$$

Write the equation.

$$x^2 = 28$$

Add 23 to each side.

$$x = \pm\sqrt{28}$$

Take square root of each side.

$$x = \pm\sqrt{4} \cdot \sqrt{7}$$

Product Property of Square Roots

$$x = \pm 2\sqrt{7}$$

Simplify.

The solutions are $x = 2\sqrt{7}$ and $x = -2\sqrt{7}$.

Key Idea**Zero-Product Property**

Words If the product of two expressions is zero, then one or both of the expressions equal zero.

Algebra If A and B are expressions and $AB = 0$, then $A = 0$ or $B = 0$.

EXAMPLE Solving a Quadratic Equation by Factoring

Solve $x^2 - 5x = 14$ by factoring.

SOLUTION

$$x^2 - 5x = 14$$

Write the equation.

$$x^2 - 5x - 14 = 0$$

Subtract 14 from each side and write the equation in standard form.

$$(x - 7)(x + 2) = 0$$

Factor the polynomial.

$$x - 7 = 0 \quad \text{or} \quad x + 2 = 0$$

Zero-Product Property

$$x = 7 \quad \text{or} \quad x = -2$$

Solve for x .

► The solutions are $x = -2$ and $x = 7$.

In Exercises 1–3, solve the equation by graphing.

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

2. $x^2 - 4x - 12 = 0$

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

4. Solve (a) $t^2 = 100$, (b) $g^2 + 2 = 66$, and (c) $2y^2 = 36$ using square roots.

In Exercises 5–7, solve the equation by factoring.

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

6. $x^2 + x = 6$

7. $m^2 + 4m = 0$