

Lesson 11-3

Example 1 Radical Equation with a Variable

The volume V of a cylinder is equal to $\pi r^2 h$ where r is the radius of the cylinder and h is the height of the cylinder.

- a. Write an equation for r .

$$V = \pi r^2 h \quad \text{Formula for the volume of a cylinder.}$$

$$\frac{V}{\pi h} = r^2 \quad \text{Divide each side by } \pi h.$$

$$\sqrt{\frac{V}{\pi h}} = r \quad \text{Take the square root of each side.}$$

- b. If the volume of a cylinder is 108π inches³ and the height is 6 inches, what is the radius?

$$r = \sqrt{\frac{V}{\pi h}} \quad \text{Formula for the radius of a cylinder}$$

$$r = \sqrt{\frac{108\pi}{\pi(6)}} \quad V = 108\pi, h = 6$$

$$r = \sqrt{18} \quad \text{Divide.}$$

$$r = 3\sqrt{2} \quad \text{Simplify.}$$

The radius of the cylinder is $3\sqrt{2}$ inches.

Example 2 Radical Equation with an Expression

Solve $\sqrt{2x-3} = 7$.

$$\sqrt{2x-3} = 7 \quad \text{Original Equation}$$

$$(\sqrt{2x-3})^2 = 7^2 \quad \text{Square each side.}$$

$$2x-3 = 49 \quad (\sqrt{2x-3})^2 = 2x-3$$

$$2x = 52 \quad \text{Add 3 to each side.}$$

$$x = 26 \quad \text{Divide each side by 2.}$$

The solution is 26. Check this result.

Example 3 Variable on Each Side

Solve $\sqrt{x+5} - 3 = x$.

$$\sqrt{x+5} - 3 = x$$

$$\sqrt{x+5} = x + 3$$

$$(\sqrt{x+5})^2 = (x+3)^2$$

$$x + 5 = x^2 + 6x + 9$$

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

$$0 = (x+1)(x+4)$$

$$x+1=0 \quad \text{or} \quad x+4=0$$

$$x = -1 \qquad \qquad x = -4$$

Solve

Original equation

Add 3 to each side.

Square each side.

Simplify.

Subtract x and 5 from each side.

Factor.

Zero Product Property

CHECK:

$$\sqrt{x+5} - 3 = x$$

$$\sqrt{-1+5} - 3 = ? -1$$

$$\sqrt{4} - 3 = ? -1$$

$$2 - 3 = ? -1$$

$$-1 = -1$$

$$\sqrt{x+5} - 3 = x$$

$$\sqrt{-4+5} - 3 \stackrel{?}{=} -4$$

$$\sqrt{1} - 3 \stackrel{?}{=} -4$$

$$1 - 3 \stackrel{?}{=} -4$$

$$-2 \neq -4$$

Since -4 does not satisfy the original equation, -1 is the only solution.