**Lesson 5–5**

## Example 1 Find Roots

**Simplify.**

**a.** $\pm\sqrt[4]{(a+b)^{16}}$

$\pm\sqrt[4]{(a+b)^{16}} = \pm\sqrt[4]{[(a+b)^4]^4}$

$= \pm(a+b)^4$

The fourth roots of $(a+b)^{16}$ are $\pm(a+b)^4$.

**b.** $\sqrt{-25}$

$\sqrt{-25} = \sqrt[2]{-25}$

$n$ is even and $b$ is negative.

Thus, $\sqrt{-25}$ is not a real number.

**c.** $\sqrt[3]{-64a^9b^{12}}$

$\sqrt[3]{-64a^9b^{12}} = \sqrt[3]{(-4a^3b^4)^3}$

$= -4a^3b^4$

The principal cube root of $-64a^9b^{12}$ is $-4a^3b^4$.

**d.** $-\sqrt[5]{-32}$

$-\sqrt[5]{-32} = -\sqrt[5]{(-2)^5}$

$= -(-2)$ or 2

The opposite of the principal fifth root of $-32$ is 2.

## Example 2 Simplify Using Absolute Value

**Simplify.**

**a.** $\sqrt[6]{c^6}$

Note that $c$ is a sixth root of $c^6$. The index is even, so the principal root is nonnegative. Since $c$ could be negative, you must take the absolute value of $c$ to identify the principal root.

$\sqrt[6]{c^6} = |c|$

**b.** $\sqrt{64(x+y)^6}$

$\sqrt{64(x+y)^6} = \sqrt[2]{[8(x+y)^3]^2}$

Since the index 2 is even and the exponent 3 is odd, you must use the absolute value of $(x+y)^3$.

$\sqrt{64(x+y)^6} = 8\,|(x+y)^3|$

## Example 3 Approximate a Square Root

**RECREATION A sporting goods store advertises that a round trampoline has an area for jumping of 100 square feet. Find the radius of the trampoline.**

**Explore** You are given the area of a circular trampoline. The formula for the area of a circle is $A = \pi r^2$.

**Plan** Solve the formula $A = \pi r^2$ for $r$. Then substitute the values for $\pi$ and $A$ into the formula. Use a calculator to evaluate.

**Solve**

$$A = \pi r^2$$

$$r^2 = \frac{A}{\pi}$$

$$r = \sqrt{\frac{A}{\pi}}$$

$$r = \sqrt{\frac{A}{\pi}} \quad \text{Formula for } r$$

$$= \sqrt{\frac{100}{\pi}} \quad A = 100$$

$$\approx 5.6 \quad \text{Use a calculator.}$$

The trampoline has a radius of about 5.6 feet.

**Examine** The radius is about 5.6 feet and $\pi$ is just over 3. The area of a circle with radius 5.6 is about $(5.6)^2 \cdot 3 = 94.08$. Since the values used for the radius and $\pi$ are low, the area will be slightly greater than 94.08 square feet. Therefore, the answer is reasonable.