

## Rational and Radical Functions

## Radical Functions

## Radical Expressions and Rational Exponents

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## Example 1

Find all real roots.

1. cube roots of 27

2. fourth roots of 625

3. cube roots of 0

## Example 2

Simplify each expression. Assume that all variables are positive.

4.  $\sqrt[3]{8x^3}$

5.  $\sqrt[4]{\frac{32}{x^4}}$

6.  $\sqrt[3]{\frac{125x^6}{6}}$

7.  $\sqrt{50x^3}$

8.  $\sqrt[4]{x^8} \cdot \sqrt[3]{x^4}$

9.  $\sqrt[3]{\frac{x^5}{4}}$

10.  $\frac{\sqrt{40x^4}}{\sqrt[3]{-x^3}}$

11.  $\sqrt[4]{\frac{x^{12}y^4}{3}}$

## Example 3

Write each expression in radical form, and simplify.

12.  $36^{\frac{3}{2}}$

13.  $32^{\frac{3}{5}}$

14.  $(-27)^{\frac{1}{3}}$

15.  $8^{\frac{2}{3}}$

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## Example 4

Write each expression by using rational exponents.

16.  $\sqrt[5]{9^{10}}$

17.  $\sqrt{8^3}$

18.  $(\sqrt[6]{5})^3$

19.  $(\sqrt[3]{27})^2$

## Example 5

Simplify each expression.

20.  $13^{\frac{1}{2}} \cdot 13^{\frac{3}{2}}$

21.  $\frac{9^{\frac{4}{3}}}{9^{\frac{2}{3}}}$

22.  $(64^{\frac{1}{2}})^{\frac{1}{3}}$

23.  $(\frac{8}{27})^{\frac{1}{3}}$

24.  $25^{-\frac{1}{2}}$

25.  $7^{\frac{1}{4}} \cdot 7^{-\frac{3}{4}}$

26.  $(-125)^{-\frac{1}{3}}$

27.  $(\frac{1}{6^2})^6$

## Example 6

28. **Geometry** The side length of a cube can be determined by finding the cube root of the volume. What is the side length to the nearest *inch* of the cube shown?

