Section 7.1: Radicals and Rational Exponents

Objectives:

* Determine the nth roots of numbers and evaluate radical expressions.
* Use the rules of exponents to evaluate or simplify expressions with rational exponents.
* Evaluate radical functions and find the domain of radical functions.

$64^{2/3}$
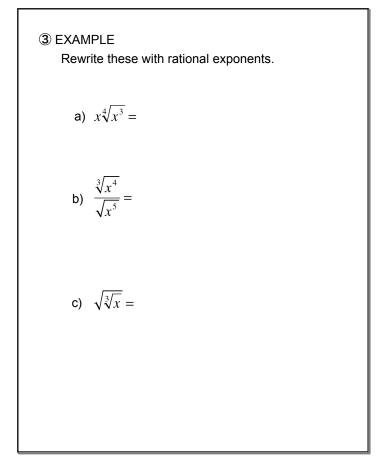
$-64^{3/2}$

$(-64)^{2/3}$

$64^{3/2}$

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n^{th} root

The principal n^{th} root of a has the same sign as a.

$$a = b^n \Leftrightarrow b = \sqrt[n]{a}$$

$$\sqrt[n]{a} = a^{1/n}$$

$$\left(\sqrt[n]{a}\right)^m = \sqrt[n]{a^m} = \left(a^m\right)^{1/n} = a^{m/n}$$

① EXAMPLE

a) $\sqrt{36} =$ b) $-\sqrt{36} =$

c) $\sqrt{-25} =$ d) $\sqrt[3]{-8} =$

e) $\sqrt[3]{27} =$ f) $\sqrt[3]{-27} =$

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② EXAMPLE

a) $8^{4/3} =$

b) $27^{-2/3} =$

c) $\left(\dfrac{64}{125}\right)^{2/3} =$

d) $(-9)^{1/2} =$ e) $-9^{1/2} =$

③ EXAMPLE

Rewrite these with rational exponents.

a) $x\sqrt[4]{x^3} =$

b) $\dfrac{\sqrt[3]{x^4}}{\sqrt{x^5}} =$

c) $\sqrt{\sqrt[3]{x}} =$

④ EXAMPLE

Simplify this.

$$\dfrac{(3x-2)^{5/3}}{\sqrt[3]{3x-2}} =$$

⑤ EXAMPLE

Determine the domain.

a) $f(x) = \sqrt{x}$ b) $f(x) = \sqrt{x^4}$

c) $g(x) = \sqrt[3]{x}$ d) $g(x) = \sqrt{x^3}$