

6.1 Rational Exponents

Obj: to simplify expressions with rational exponents.

Rational (Fraction)

Defn: $x^{\frac{1}{n}} = \sqrt[n]{x}$

EX:

$$49^{\frac{1}{2}} \quad 8^{\frac{1}{3}} \quad 49^{-\frac{1}{2}}$$
$$\sqrt{49} = (7) \quad \sqrt[3]{8} = (2) \quad \frac{1}{\sqrt{49}} = (.143)$$

Defn: $x^{\frac{1}{n}} = \sqrt[n]{x}$

EX:

$$125^{-\frac{1}{3}} \qquad (-32)^{-\frac{1}{5}}$$

$$\sqrt[3]{125} = \left(\begin{array}{c} 1 \\ 5 \\ \text{or} \\ .2 \end{array} \right) \qquad \sqrt[5]{-32} = \left(\begin{array}{c} 1 \\ -2 \\ \text{or} \\ -.5 \end{array} \right)$$

Defn: $x^{\frac{m}{n}} = \left(\sqrt[n]{x} \right)^m \text{ or } = \sqrt[n]{x^m}$

EX:

$8^{\frac{2}{3}}$ $(\sqrt[3]{8})^2 = (4)$ or $\sqrt[3]{8^2}$	$8^{-\frac{2}{3}}$ $\frac{1}{(\sqrt[3]{8})^2} = .25$	$16^{\frac{5}{2}}$ $\sqrt[2]{16^5} = 1024$ or $(\sqrt{16})^5$
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Defn: $x^{\frac{m}{n}} = (\sqrt[n]{x})^m$ or $= \sqrt[n]{x^m}$

EX:

$$81^{\frac{3}{4}}$$

$$\begin{aligned} & \sqrt[4]{81^3} \\ & \text{or} \\ & (\sqrt[4]{81})^3 \end{aligned} = 27$$

$$125^{-\frac{2}{3}}$$

$$= .04$$

Misc. Examples:

$$5 \cdot 8^{\frac{4}{3}}$$

$$80$$

$$-5 \cdot (-8)^{\frac{4}{3}}$$

$$80$$

$$-5 \cdot 8^{-\frac{4}{3}}$$

$$-.3125$$

Misc. Examples:

$$243^{-\frac{2}{5}} \cdot (-27)^{\frac{5}{3}}$$

$$6^{-1} \cdot 5^0 \cdot 100^{-\frac{1}{2}}$$

$$1.67$$

$$-27$$