5-2: Growth & Decay Rational Exponents

Learning Targets:

- I can define and apply rational exponents

Rational Exponents & Radicals

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

$$x^{\frac{m}{n}} = \sqrt[n]{x^m} = (\sqrt[n]{x})^m$$

Examples:

$$x^{\frac{1}{3}} = \sqrt[3]{x}$$

$$x^{\frac{1}{7}} = \sqrt[7]{x}$$

Examples:

$$x^{\frac{2}{3}} = \sqrt[3]{x^2} = (\sqrt[3]{x})^2$$

$$x^{\frac{7}{5}} = \sqrt[5]{x^7} = (\sqrt[5]{x})^7$$

Examples: Simplify.

1) $16^{\frac{1}{4}} = \sqrt[4]{16} = 2$

2) $16^{-\frac{1}{4}} = \frac{1}{16^{\frac{1}{4}}} = \frac{1}{\sqrt[4]{16}} = \frac{1}{2}$ OR $= \left(16^{\frac{1}{4}}\right)^{-1} = 2^{-1} = \frac{1}{2}$

Examples: Simplify.

3) $8^{\frac{2}{3}} = \left(\sqrt[3]{8}\right)^2 = 2^2 = 4$

4) $8^{-\frac{2}{3}} = \frac{1}{8^{\frac{2}{3}}} = \frac{1}{\left(\sqrt[3]{8}\right)^2} = \frac{1}{4}$ OR $= \left(8^{\frac{2}{3}}\right)^{-1} = 4^{-1} = \frac{1}{4}$

Examples: Simplify.

5) $3m^{\frac{3}{2}}n^{\frac{1}{3}} \cdot m^{-\frac{1}{4}}n^{\frac{3}{2}}$

$3m^{\frac{5}{4}}n^{\frac{11}{6}}$

Examples: Simplify.

6) $\dfrac{3xy^{\frac{5}{3}}}{2x^{-\frac{7}{4}}y^{-\frac{1}{3}}}$

$\dfrac{3y^2x^{\frac{11}{4}}}{2}$

Examples: Simplify.

7) $\left(x^{-4}y^{-\frac{3}{4}}\right)^2$ $\quad \dfrac{y^{\frac{1}{2}}}{x^8y^2}$

Practice Problems

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