8.5: Dividing Radical Expressions

I. Using the Radical Quotient Rule

Rule: Radical Quotient Rule

If $\sqrt[n]{a}$ *and* $\sqrt[n]{b}$ *are real numbers and* $b \neq 0$*, then*

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

Example 1: Simplify the quotient.

$$\frac{\sqrt[3]{48x^3y^8}}{\sqrt[3]{3x^2y^2}}$$

II. Rationalizing Denominators containing one term

Rationalizing the Denominator:

Writing an equivalent expression in which the denominator is ____________________

Example 2: Rationalize the denominator

a) $\frac{6}{\sqrt{2}}$

b) $\sqrt{\frac{2x}{6y}}$

c) $\sqrt[3]{\frac{2}{25}}$

d) $\frac{\sqrt[3]{9}}{\sqrt[3]{4}}$

e) $\frac{\sqrt[3]{x}}{\sqrt[3]{9y}}$

f) $\frac{6x}{\sqrt[5]{8x^3y^4}}$

You try it: *Rationalize the Denominator*

a) $\dfrac{\sqrt{12}}{\sqrt{6x^3}}$ b) $\dfrac{\sqrt[3]{2}}{\sqrt[3]{9x}}$

III. Rationalizing Denominators with two terms.

Radical Conjugates: The conjugate of $\sqrt{a}+\sqrt{b}$ is $\sqrt{a}-\sqrt{b}$.

The product of radical conjugates is $\left(\sqrt{a}+\sqrt{b}\right)\left(\sqrt{a}-\sqrt{b}\right) = a - b$.

Example 5: Rationalize the denominator and simplify.

a. $\dfrac{5}{\sqrt{5}+x}$ b. $\dfrac{3+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

c. $\dfrac{2}{x+\sqrt{2}} + \dfrac{3}{x-\sqrt{2}}$

IV. Terms with different Indices

When working with radical terms in different indices, it is often useful to write the radicals with rational exponents, simplify, then change back to a radical.

Example: Simplify completely. Write your answer in radical notation.

a. $\dfrac{\sqrt[6]{(x+5)^4}}{\sqrt{x+5}}$ b. $\sqrt{x^5} \cdot \sqrt[3]{x^2}$

c. $\dfrac{\sqrt[3]{a^2b^5}}{\sqrt{ab^3}}$