

Worksheet #2 – Radical Operations

A: Binomial Radical Expressions

Like Radicals are radicals that have the same index and the same radicand. If radical terms are “like”, we can add or subtract them.

Ex: Add or subtract if possible. It may be necessary to simplify the radicals first to see if you have like terms.:

$$5\sqrt[3]{x} - 3\sqrt[3]{x}$$

$$5\sqrt{75} + 2\sqrt{12}$$

$$2\sqrt{3} + 3\sqrt{27}$$

$$\sqrt{50} - 4\sqrt{32} + 3\sqrt{12}$$

$$5\sqrt{3} - 7\sqrt{12} + 3\sqrt{75}$$

B: Multiplying Radical Expressions

Multiplying Radical Expressions

- If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, then $\sqrt[n]{a} \sqrt[n]{b} = \sqrt[n]{ab}$.

Ex: Multiply and simplify answer if necessary.

- $\sqrt{3} \sqrt{12}$

- $\sqrt[3]{3} \sqrt[3]{-9}$

- $\sqrt[4]{4} \sqrt[4]{-4}$

- $\sqrt{3x} \sqrt{24x^2}$

- $\sqrt[3]{40n^2} \sqrt[3]{2n^3}$

- Simplify $\sqrt[3]{54x^2y^3} \sqrt[3]{5x^3y^4}$.

Assume all variables are positive.

C: Dividing Radical Expressions

- If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers

and $b \neq 0$, then $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$.

C: Dividing Radical Expressions

Ex: Divide. Assume all variables are positive.

$$\frac{\sqrt[3]{32}}{\sqrt[3]{-4}}$$

$$\frac{\sqrt[3]{162x^5}}{\sqrt[3]{3x^2}}$$

$$\frac{\sqrt[4]{1024x^6}}{\sqrt[4]{4x}}$$

D: Rationalizing the denominator

- To be in simplest form, a radical expression should have all perfect roots taken out of the radicand, and it should not have a radical in the denominator.

Ex: Rationalize the denominator of each expression. Assume all variables are positive.

$$\frac{\sqrt{2}}{\sqrt{3}}$$

$$\frac{\sqrt{x^3}}{\sqrt{5xy}}$$

$$\sqrt[3]{\frac{2}{3x}}$$

$$\sqrt{\frac{7}{5}}$$

$$\frac{\sqrt{2x^3}}{\sqrt{10xy}}$$

$$\frac{\sqrt[3]{4}}{\sqrt[3]{6x}}$$

E: Multiplying and Dividing Binomial Radical Expressions

Ex: $(3+2\sqrt{5})(2+4\sqrt{5})$

$(-2+2\sqrt{5})(6-2\sqrt{5})$

$(7-6\sqrt{8})^2$

$(\sqrt{5}+\sqrt{6})(\sqrt{5}-\sqrt{6})$

F: Rationalizing Binomial Denominators

- Multiply by a fraction of $\frac{\text{conjugate of denominator}}{\text{conjugate of denominator}}$. Simplify.

$$\frac{3+\sqrt{5}}{1-\sqrt{5}}$$

$$\frac{5+\sqrt{7}}{4+\sqrt{3}}$$