Chapter 7 Section 4
Adding, Subtracting, and Dividing Radical Expressions

The procedure of Addition and Subtraction like radical is similar to combining similar terms. If the radicals are the same, then add or subtract the coefficient of the radicals.

Example:

$7\sqrt{2}+9\sqrt{2}$

Solution

$7\sqrt{2}+9\sqrt{2}$

$(7+9)\sqrt{2}$

$16\sqrt{2}$

Another one

$\sqrt[3]{5}-4x\sqrt[3]{5}+8\sqrt[3]{5}$

Solution

$\sqrt[3]{5}-4x\sqrt[3]{5}+8\sqrt[3]{5}$

$(1-4x+8)\sqrt[3]{5}$

$(9+4x)\sqrt[3]{5}$

Try:

- $8\sqrt{5}-6\sqrt{5}$
- $4x\sqrt[4]{3x}+2\sqrt[4]{3x}-6\sqrt[4]{3x}$

Simplify then combine radicals

$\sqrt{2}+\sqrt{8}$

Try:

- $5\sqrt{28}+\sqrt{35}$
- $4\sqrt{9x}-8\sqrt{12x}$

Dividing Radical Expressions

The Quotient Rule for Radicals

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

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

The *nth* root of a quotient is the quotient of the *nth* roots of the numerator and denominator.

If a fraction is the radicand, then the radical can be written as a quotient of two radicals.

$$\sqrt[3]{\frac{16}{27}}$$

$$\frac{\sqrt[3]{16}}{\sqrt[3]{27}}$$

$$\frac{\sqrt[3]{8\bullet 2}}{\sqrt[3]{(3)^3}}$$

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

Another example

$$\sqrt{\frac{x^2}{25y^6}}$$

$$\frac{\sqrt{x^2}}{\sqrt{25y^6}}$$

$$\frac{x}{5y^3}$$

Try:

* $\sqrt[3]{\frac{24}{125}}$
* $\sqrt[3]{\frac{8y^7}{x^{12}}}$

Dividing Radicals Expressions
Quotient of two radicals can we written as a quotient of one radical.

Example:

$$\frac{\sqrt{48x^3}}{\sqrt{6x}}$$

$$\sqrt{\frac{48x^3}{6x}}$$

$$\sqrt{8x^2}$$

$$2x\sqrt{2}$$

Example 2: $\frac{\sqrt{45xy}}{2\sqrt{5}}$

Try:

* $\frac{\sqrt{50xy}}{2\sqrt{2}}$
* $\frac{\sqrt[3]{48x^7y}}{\sqrt[3]{6xy^{-2}}}$