Dividing Radical Expressions (7.4) **Math 098**

Method: (The quotient rule for radicals) For any real numbers $\sqrt[n]{a}$ and $\sqrt[n]{b}, b \neq 0$, we have $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

Example 1: Simplify

a.) $\sqrt{\frac{144}{81}} = \frac{\sqrt{144}}{\sqrt{81}}$

$= \frac{12}{9}$

$= \frac{4}{3}$

b.) $\sqrt[3]{\frac{125}{216}} = \frac{\sqrt[3]{125}}{\sqrt[3]{216}}$

$= \frac{5}{6}$

c.) $\sqrt{\frac{25x^5}{y^6}} = \frac{5x^2}{y^3}\sqrt{x}$

$= \frac{5x^2\sqrt{x}}{y^3}$

d.) $\sqrt[3]{\frac{8a^8}{27b^{14}}} = \frac{2a^2}{3b^4}\sqrt[3]{\frac{a^2}{b^2}}$

e.) $\frac{\sqrt{50}}{\sqrt{2}} = \sqrt{\frac{50}{2}}$

$= \sqrt{25}$

$= 5$

f.) $\frac{\sqrt[3]{81}}{\sqrt[3]{3}} = \sqrt[3]{\frac{81}{3}}$

$= \sqrt[3]{27}$

$= 3$

g.) $\frac{\sqrt{72xy}}{2\sqrt{2}} = \frac{1}{2}\frac{\sqrt{72xy}}{\sqrt{2}}$

$= \frac{1}{2}\sqrt{\frac{72xy}{2}}$

$= \frac{1}{2}\sqrt{36xy}$

$= \frac{6}{2}\sqrt{xy}$

$= 3\sqrt{xy}$

h.) $\frac{\sqrt[5]{64a^{11}b^{28}}}{\sqrt[5]{2ab^{-2}}} = \sqrt[5]{\frac{64a^{11}b^{28}}{2ab^{-2}}}$

$= \sqrt[5]{32a^{10}b^{30}}$

$= 2a^2b^6$

Concept: Rationalizing the Denominator

How might we add $\sqrt{\frac{1}{3}}$ and $\frac{1}{3}$?

$\underbrace{\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}}_{\frac{\sqrt{3}}{3}}$ and $\frac{1}{3}$ LCD = 3

Example 2: Rationalize the denominator

a.) $\sqrt{\frac{5}{11}}$

$= \frac{\sqrt{5}}{\sqrt{11}} \cdot \frac{\sqrt{11}}{\sqrt{11}}$

$= \frac{\sqrt{55}}{11}$

b.) $\frac{3}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$

$= \frac{3\sqrt{7}}{7}$

c.) $\frac{2}{\sqrt{5}-3}$ multiply by the conjugate.

$\sqrt{5}-3$ and $\sqrt{5}+3$

$2-\sqrt{7}$ and $2+\sqrt{7}$

$\sqrt{13}+1$ and $\sqrt{13}-1$

$= \frac{2}{\sqrt{5}-3} \cdot \frac{\sqrt{5}+3}{\sqrt{5}+3}$

$= \frac{2\sqrt{5}+6}{5+\cancel{3\sqrt{5}}-\cancel{3\sqrt{5}}-9}$

$= \frac{2\sqrt{5}+6}{-4}$

$= -\frac{\sqrt{5}+3}{2}$

d.) $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} \cdot \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$= \frac{(\sqrt{3}+\sqrt{2})^2}{3+\cancel{\sqrt{6}}-\cancel{\sqrt{6}}-2}$

$= (\sqrt{3}+\sqrt{2})^2$