Section 7.4: Quotients, Powers, and Rationalizing the Denominator

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8:35 AM

rationalize the denominator:

$$\frac{1}{\sqrt{5}}\,\frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{5}$$

$$\sqrt{\frac{2}{3}}\,\sqrt{\frac{3}{3}} = \frac{\sqrt{6}}{3}$$

$$\frac{1}{\sqrt[3]{2}}\,\frac{\sqrt[3]{4}}{\sqrt[3]{4}} = \frac{\sqrt[3]{4}}{\sqrt[3]{8}} = \frac{\sqrt[3]{4}}{2}$$

$$\sqrt[3]{\frac{2}{9}}$$

the easy way:

$$\sqrt[3]{\frac{2}{9}} \cdot \sqrt[3]{\frac{3}{3}} = \frac{\sqrt[3]{6}}{3}$$

the hard way:

$$\sqrt[3]{\frac{2}{9}} \cdot \sqrt[3]{\frac{9^2}{9^2}} = \sqrt[3]{\frac{2\cdot 81}{9^3}}$$

$$= \frac{\sqrt[3]{2\cdot 81}}{9}$$

$$= \frac{\sqrt[3]{2\cdot 3^4}}{9}$$

$$= \frac{\cancel{3}\,\sqrt[3]{2\cdot 3}}{\cancel{9}}$$

$$\overline{}$$
$$\cancel{9}\ 3$$

$$= \frac{\sqrt[3]{6}}{3}$$

simplify:

$$\sqrt{\frac{5x}{2y}}\sqrt{\frac{2y}{2y}} = \frac{\sqrt{10xy}}{2y}$$

$$\sqrt[3]{\frac{3}{4a^2b}}\sqrt[3]{\frac{2ab^2}{2ab^2}} = \frac{\sqrt[3]{6ab^2}}{2ab}$$

dividing radicals:

$$(5\sqrt{12}) \div (4\sqrt{6}) = \frac{5\sqrt{12}}{4\sqrt{6}}$$

$$\boxed{\frac{\sqrt{12}}{\sqrt{6}} = \sqrt{\frac{12}{6}}}$$

$$= \frac{5\sqrt{2}}{4} = \frac{5}{4}\sqrt{2}$$

$$(2\sqrt{2}) \div (4\sqrt{10}) = \frac{2\sqrt{2}}{4\sqrt{10}}$$

$$= \frac{1}{2\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$= \frac{\sqrt{5}}{10}$$

$$\frac{-6+\sqrt{72}}{-6} = \frac{-6+\sqrt{8\cdot 9}}{-6}$$

$$= \frac{-6+\sqrt{2\cdot 4\cdot 9}}{-6}$$

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

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

$$= 1-\sqrt{2}$$

$$\frac{1}{1-\sqrt{2}}\left(\frac{1+\sqrt{2}}{1+\sqrt{2}}\right) = \frac{1+\sqrt{2}}{1-2}$$

$$= \frac{1+\sqrt{2}}{-1}$$

conjugates

$$= -1-\sqrt{2}$$

$$\frac{\sqrt{3}}{\sqrt{3}+\sqrt{2}}\left(\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}\right) = \frac{3-\sqrt{6}}{3-2}$$

$$= 3-\sqrt{6}$$

$$\frac{2-\sqrt{3}}{\sqrt{2}+\sqrt{6}}\left(\frac{\sqrt{2}-\sqrt{6}}{\sqrt{2}-\sqrt{6}}\right) = \frac{2\sqrt{2}-2\sqrt{6}-\sqrt{6}+\sqrt{18}}{2-6}$$

$$= \frac{2\sqrt{2} - 3\sqrt{6} + 3\sqrt{2}}{-4}$$

$$= \frac{5\sqrt{2} - 3\sqrt{6}}{-4}\left(\frac{-1}{-1}\right)$$

$$= \frac{3\sqrt{6} - 5\sqrt{2}}{4}$$

powers of radical expressions:

$$(ab)^n = a^n b^n$$

$$\left(2\sqrt{x^3}\right)^4 = 2^4\left(\sqrt{x^3}\right)^4$$

$$= 2^4 \sqrt{x^{12}}$$

why?

$$\sqrt{x^3} = x^{3/2}$$

$$\left(\sqrt{x^3}\right)^4 = \left(x^{3/2}\right)^4$$

$$= x^{12/2}$$

$$= x^6$$

$$= 16x^6$$

or $\sqrt{x^3}\sqrt{x^3}\sqrt{x^3}\sqrt{x^3} = \sqrt{x^{12}}$

$$\left(-3\sqrt[3]{4}\right)^2 = 9\sqrt[3]{4^2}$$

$$= 9\sqrt[3]{16}$$

$$= 9\sqrt[3]{8 \cdot 2}$$

$$= 18\sqrt[3]{2}$$

$$\left(-5\sqrt[3]{x^2 y}\right)^2 = 25\sqrt[3]{x^4 y^2}$$

$$= 25x\sqrt[3]{x y^2}$$