7.4 Rational Exponents

Another way to write square roots, cube roots, fourth roots, fifth roots, etc. is to use a *rational exponent*...

$$\sqrt{x} = x^{\frac{1}{2}} \qquad \sqrt[3]{x} = x^{\frac{1}{3}}$$

$$\sqrt[4]{x} = x^{\frac{1}{4}} \qquad \sqrt[5]{x} = x^{\frac{1}{5}}$$

The root turns into the denominator of the fraction.

Simplify each expression:

$125^{\frac{1}{3}}$ $\sqrt[3]{125}$ 5

$16^{\frac{1}{4}}$ $\sqrt[4]{16}$ 2

$5^{\frac{1}{2}} \bullet 5^{\frac{1}{2}}$ $\sqrt{5} \cdot \sqrt{5}$ $\sqrt{25}$ 5

$2^{\frac{1}{2}} \bullet 8^{\frac{1}{2}}$ $\sqrt{2}\sqrt{8}$ $\sqrt{16}$ 4

$10^{\frac{1}{3}} \bullet 100^{\frac{1}{3}}$

$\sqrt[3]{10}\ \sqrt[3]{100}$

$\sqrt[3]{1000}$

10

Converting to and from Radical Form:

$x^{\frac{3}{5}}$	$\sqrt[5]{x^3}$	$(\sqrt[5]{x})^3$
$y^{-2.5}$	$y^{-\frac{5}{2}}$	$\sqrt{y}^{-5}$
$\left(\sqrt[5]{b}\right)^2$	$b^{2/5}$	
$\sqrt{a^3}$	$a^{3/2}$	
$y^{-\frac{3}{8}}$	$\sqrt[8]{y^{-3}}$	
$z^{0.4}$	$z^{\frac{2}{5}}$	$\sqrt[5]{z^2}$
$\sqrt{y^3}$	$y^{3/2}$	

Simplify the following...remember the rules for exponents from several chapters ago... (page 387)

$(-32)^{\frac{3}{5}}$

$\sqrt[5]{-32}^{\,3}$

$\sqrt[5]{-32768}$

-8

$25^{-\frac{3}{2}}$

$(-32)^{\frac{4}{5}}$

$(8x^{15})^{-\frac{1}{3}}$

$4^{-3.5}$

$-\frac{35}{10}$

$4^{-\frac{7}{2}}$

$\sqrt{4}^{\,-7}$

2^{-7}

$.0078125$

$32^{\frac{3}{5}}$

$(16y^{-8})^{-\frac{3}{4}}$

$16^{-3/4}(y^{-8})^{-3/4}$

$\sqrt[4]{16}^{\,-3} \quad y^{6}$

$2^{-3}y^{6}$

$.125y^{6}$

Problems for YOU to work on...

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#'s 1 - 25 even or odd, you decide
30 - 49 even or odd, you decide