Name ______________________________ Date ____________________

Rational Exponents

Notes: Lesson 5

Rational exponents are really just radical expressions in disguise. Use the following rule to convert between the two:

$$\boxed{a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m}$$

Example 1... Convert to radical form/exponent form (whichever it's not already in).

a. $x^{2/7}$

$\sqrt[7]{x^2}$ or $\left(\sqrt[7]{x}\right)^2$

b. $\sqrt[4]{c^3}$

$c^{3/4}$

c. $4^{1/2}$

$\sqrt{4} = 2$

Properties of Rational Exponents	
Property:	**Example:**
$x^m \cdot x^n = x^{m+n}$	$x^2 \cdot x^5 = x^7$
$\frac{x^m}{x^n} = x^{m-n}$	$\frac{x^6}{x^2} = x^4$
$(x^m)^n = x^{m \cdot n}$	$(y^3)^4 = y^{12}$
$(x \cdot y)^m = x^m \cdot y^m$	$(ab)^3 = a^3b^3$
$\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$	$\left(\frac{x}{y}\right)^4 = \frac{x^4}{y^4}$
$x^{-m} = \frac{1}{x^m}$ / $\frac{1}{x^{-m}} = x^m$	$2a^{-3} = \frac{2}{a^3}$ / $\frac{4}{y^{-5}} = 4y^5$

Example 2... **Use properties of exponents to simplify each expression as much as possible.**

a. $64^{1/3}$

$\sqrt[3]{64} = \boxed{4}$

b. $7^{1/2} \cdot 7^{1/2}$

$\sqrt{7} \cdot \sqrt{7} = \sqrt{49} = \boxed{7}$

c. $5^{1/3} \cdot 25^{1/3}$

$\sqrt[3]{5} \cdot \sqrt[3]{25}$

$\sqrt[3]{125} = \boxed{5}$

d. $32^{3/5}$

$\sqrt[5]{32}^{\,3} = 2^3 = \boxed{8}$

e. $(3x^{2/3})^{-3}$

$\frac{2}{3} \cdot \frac{-3}{1} = \frac{-6}{3} = -2$

$3^{-3}x^{-2}$

$\frac{1}{3^3x^2} = \boxed{\frac{1}{27x^2}}$

f. $(x^{2/3}y^{-1/6})^{-12}$

$\frac{2}{3} \cdot \frac{-12}{1} = \frac{-24}{3} = -8$

$-\frac{1}{6} \cdot \frac{-12}{1} = \frac{12}{6} = 2$

$x^{-8}y^2$

$\boxed{\frac{y^2}{x^8}}$

g. Write the expression in simplest form: $(8x^{15})^{-1/3}$

$\frac{15}{1} \cdot -\frac{1}{3} = \frac{-15}{3} = -5$

$8^{-1/3}x^{-5}$

$\frac{1}{8^{1/3}x^5} = \frac{1}{\sqrt[3]{8}x^5} = \boxed{\frac{1}{2x^5}}$