WARMUP - Tape Formula Sheet into Notebook

Section 9.2 Rational Exponents

$$\underset{\text{Radical}}{\sqrt[n]{a}} = \underset{\text{Rational}}{a^{1/n}}$$

$$\sqrt[4]{17} = 17^{\frac{1}{4}}$$

on calculator

17 ^ (1/4)

≈ 2.03

ex: a) $16^{\frac{1}{2}} = \sqrt{16} = 4$ (Rational → Radical)

b) $\left(-\frac{27}{8}\right)^{\frac{1}{3}} = \sqrt[3]{-\frac{27}{8}} = -\frac{3}{2}$

c) $\left(625a^4\right)^{\frac{1}{4}} = \sqrt[4]{625a^4} = 5a$

$\sqrt[n]{x^n} = x$

$$x^{m/n} = \left(\sqrt[n]{x}\right)^m = \sqrt[n]{x^m}$$

ex: a) $16^{3/4} = \left(\sqrt[4]{16}\right)^3 = 2^3 = 8$

b) $125^{4/3} = \left(\sqrt[3]{125}\right)^4 = 5^4 = 625$

c) $\left(4c^4\right)^{3/2} = \left(\sqrt{4c^4}\right)^3 = \left(2c^2\right)^3 = 2^3\left(c^2\right)^3 = 8c^6$

d) $-\left(32a^{10}\right)^{3/5} = -\left(\sqrt[5]{32a^{10}}\right)^3 = -\left(2a^2\right)^3 = -8a^6$

$$x^{-m/n} = \frac{1}{x^{m/n}}$$

a) $9^{-\frac{1}{2}} = \frac{1}{9^{\frac{1}{2}}} = \frac{1}{\sqrt{9}} = \frac{1}{3}$

b) $(36)^{-3/2} = \frac{1}{36^{3/2}} = \frac{1}{(\sqrt{36})^3} = \frac{1}{6^3} = \frac{1}{216}$

c) $(-27x^3)^{-2/3} = \frac{1}{(-27x^3)^{2/3}} = \frac{1}{(\sqrt[3]{-27x^3})^2}$

$= \frac{1}{(-3x)^2} = \frac{1}{9x^2}$

ex: $2^{\frac{1}{5}} \cdot 2^{\frac{2}{5}} = 2^{\frac{1}{5}+\frac{2}{5}} = 2^{\frac{3}{5}}$

$a^m \cdot a^n = a^{m+n}$

$(a^m)^n = a^{mn}$

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

$(x^{\frac{1}{3}} y^{\frac{2}{3}})^9 = (x^{\frac{1}{3}})^9 (y^{\frac{2}{3}})^9$

$= x^3 y^6$

Simplifying Radicals:

1) Change radical expression to rational exponents.
2) Simplify
3) Switch back to radical form.

ex: a) $\sqrt[6]{3^3} = 3^{3/6} = 3^{1/2} = \sqrt{3}$

b) $\sqrt[4]{49x^2y^2} = (49x^2y^2)^{1/4}$

$= ((7xy)^2)^{\frac{1}{4}}$

$= (7xy)^{\frac{2}{4}} = (7xy)^{\frac{1}{2}} = \sqrt{7xy}$

c) $\sqrt[3]{\sqrt[4]{m}} = \sqrt[3]{m^{\frac{1}{4}}} = (m^{\frac{1}{4}})^{\frac{1}{3}} = m^{\frac{1}{12}}$

$= \sqrt[12]{m}$

$$\sqrt[n]{\sqrt[m]{x}} = \sqrt[n \cdot m]{x}$$

Work on 10.2 worksheet

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$$

$$\left(\frac{27}{125}\right)^{-\frac{1}{3}} = \left(\frac{125}{27}\right)^{\frac{1}{3}} = \sqrt[3]{\frac{125}{27}}$$

13) $\frac{x^{\frac{1}{3}}}{x^{6/7}} = x^{\frac{1}{3}-\frac{6}{7}} = x^{\frac{7}{21}-\frac{18}{21}} = x^{-\frac{11}{21}}$

15) $\left(x^{-1/4} y^{7/5}\right)^{3/4} = \left(x^{-1/4}\right)^{3/4} \left(y^{7/5}\right)^{3/4}$

$= x^{-3/16} y^{21/20}$

16) $f(x) = 70x^{3/4} = 70 \cdot 49^{3/4} \approx 1296$

70 x 49 ^ (3/4)

19) $\frac{\sqrt[3]{4}}{\sqrt[5]{4}} = \frac{4^{\frac{1}{3}}}{4^{\frac{1}{5}}} = 4^{\frac{1}{3}-\frac{1}{5}} = 4^{\frac{5}{15}-\frac{3}{15}}$

$= 4^{2/15}$

$= \sqrt[15]{4^2}$

$= \sqrt[15]{16}$