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College Readiness Algebra II
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Rules for exponents

$$\underset{\text{base}}{b}^{\,n \leftarrow \text{exponent, order, power}} = \underbrace{b \cdot b \cdot \ldots \cdot b}_{n \text{ times}}$$

$$2^3 = 2 \cdot 2 \cdot 2 = 8$$

$$w^3 = w \cdot w \cdot w$$

Product Rule for exponents :

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

ex. $w^3 \cdot w^5 = w^8$

Quotient rule for exponents :

$b \neq 0 \quad \dfrac{b^m}{b^n} = b^{m-n}$

Ex. $\dfrac{x^5}{x^3} = x^{5-3} = x^2$

$$\frac{x^5}{x^3} = \frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x} = x^2$$

Zero exponent Rule :

$b \neq 0 \quad b^0 = 1 \qquad 2x^0 = 2(1) = 2$

$x \neq 0 \quad (2x)^0 = 1 \qquad -20^0 = -1$

$(-20)^0 = 1$

Negative Exponent Rule:

$b \neq 0 \qquad \frac{b^{-m}}{1} = \frac{1}{b^m}$

$\frac{1}{b^{-m}} = b^m$

$\frac{x^3}{x^5} = \frac{x^{-2}}{1} = \frac{1}{x^2}$

Power Rules:

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

Ex. $(x^3)^5 = x^{15}$

$x^3 \cdot x^3 \cdot x^3 \cdot x^3 \cdot x^3$

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

Ex. $(2x^3)^5 = 2^5 (x^3)^5$

$= 32x^{15}$

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

Ex. $\left(\frac{2}{x^3}\right)^5 = \frac{2^5}{x^{10}} = \frac{32}{x^{10}}$

Special Rule

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

$\left(\frac{1}{3}\right)^{-3} = 3^3 = 27$

Simplify

$$\frac{y^4 z^3}{2y^4 z^2} = \frac{z}{2}$$

$$3^{-3} = \frac{1}{3^3} = \frac{1}{27}$$

Squaring a bionomial

$$(u+v)^2 = (u+v)(u+v)$$

$$= u^2 + uv + uv + v^2$$

$$= u^2 + 2uv + v^2$$

$$(u-v)^2 = u^2 - 2uv + v^2$$

Degree of a polynomial (with one variable)

$$2x^3 + 3x^7 - 5x^2 + 6$$

$3x^7 + 2x^3 - 5x^2 + 6$ seventh degree polynomial

leading coefficient

Degree of a polynomial with multiple variables

$$13w^2u^3v^3 - 3 + v^6w^1 - 5u^6$$

Degree of term is 8

Degree term is 0

Degree of term is 7

Degree of term is 6

Rules for Radicals

$\sqrt{36} = 6$

$\sqrt{121} = 11$

$-\sqrt{121} = -11$

$\sqrt{-36} = \sqrt{-1}\sqrt{36}$

$= 6i$

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

$\sqrt[n]{a} = b$

means $b^n = a$

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

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

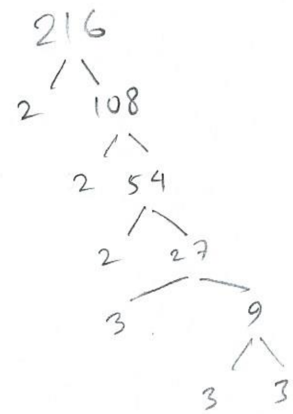
Product Rule for Radicals

$\sqrt[n]{a} \cdot \sqrt[n]{b} \iff \sqrt[n]{ab}$

$\sqrt{-216} = \sqrt{-1}\sqrt{216}$

$= i\sqrt{216}$

$= 6i\sqrt{6}$



$\sqrt{36}\sqrt{6}$

$6\sqrt{6}$

Rules for Radicals

$\sqrt{32} = \sqrt{16}\sqrt{2}$

$= 4\sqrt{2}$

Quotient Rule for Radicals

$$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} \Leftrightarrow \sqrt[n]{\frac{a}{b}}$$

$$\sqrt{\frac{100}{121}} = \frac{\sqrt{100}}{\sqrt{121}} = \frac{10}{11}$$

if n is even

$$\sqrt[n]{b^n} = |b|$$

$$\sqrt{6^2} = 6$$

$$\sqrt{(-6)^2} = \sqrt{36} = 6$$

if n is odd

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

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

$$\sqrt[3]{(-2)^3} = \sqrt[3]{-8} = -2$$

$$\sqrt{x^2} = |x|$$

$$\sqrt[3]{x^3} = x$$

$$\sqrt[6]{x^{12}} = \sqrt[6]{(x^2)^6}$$

$$= |x^2|$$

$$= x^2.$$

$\sqrt[6]{x^{12}} = |x|^{12/6}$

$= x^2$

$b^{m/n} = \sqrt[n]{b^m}$

$= (\sqrt[n]{b})^m$

$\sqrt[8]{x^2} = |x|^{2/8}$

$= |x|^{1/4}$

$= \sqrt[4]{|x|}$

Polynomial long division

$-20x^4 - 4x^3 + 9x^2 + 5 \div -4x^2 + 1$

$5x^2 + x - 1$

$-4x^2 + 0x + 1 \;\big)\; -20x^4 - 4x^3 + 9x^2 + 5$

$-20x^4 + 0x^3 + 5x^2 \downarrow$

$-4x^3 + 4x^2 + 0x$

$-4x^3 + 0x^2 + x$

$4x^2 - x + 5$

$4x^2 - 0x - 1$

$-x + 6$

synthetic division can be done when your division in form of $x+a$ or $x-a$

$4x^2+15x+14 \div x+2$

those are the coefficients →

$x+2=0$

$x=-2$

$$\begin{array}{r|rrr} & 4 & 15 & 14 \\ -2 & \text{bring down} & -8 & -14 \\ \hline & 4 & 7 & \boxed{0} \end{array}$$

$4x+7$ ↑ remainder

$$(4x+7)(x+2)=4x^2+15x+14$$