

#16 Exponent Rules

10/13/15

(1) Multiplying like bases: when multiplying like bases add their exponents

$$a^r \cdot a^s = a^{r+s}$$

(Ex) $x^5 \cdot x^8 = x^{13}$

(Ex) $3m m^4 = 3m^5$

(2) Dividing like bases: when dividing like bases we subtract exponents

$$\frac{a^r}{a^s} = a^{r-s}$$

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

(Ex) $\frac{3m^4}{9m} = \frac{1m^3}{3}$

(Ex) $\frac{y^2 z}{y^6 z^3} = \frac{yy}{yyyyyy} = \frac{1}{y^4 z^2}$

(3) Power to a Power: when a power is raised to another power we multiply

$$(a^r)^s = a^{rs}$$

(Ex) $(x^4)^5 = x^{20} \rightarrow x^4 \cdot x^4 \cdot x^4 \cdot x^4 \cdot x^4$

(Ex) $(5x^6 y^2)^2 = 25 x^{12} y^4$

(Ex) $\left(\frac{2a}{b^2 c}\right)^3 = \frac{8a^3}{b^6 c^3}$

(4) Zero power Rule: anything raised to the zero power equals 1

$$a^0 = 1$$

(Ex) $3^0 = 1$

(Ex) $(5x)^0 = 1$

(Ex) $\left(\frac{2x}{7y}\right)^0 = 1$

(Ex) $6x^0 = 6 \cdot 1 = 6$

(5) Negative Exponents: If something has a negative exponent, move it across fraction bar and make it positive

$$a^{-2} = \frac{1}{a^2}$$

OR $\frac{1}{b^{-7}} = b^7$

(Ex) $\frac{x^2 y^{-4}}{z^5} = \frac{x^2}{y^4 z^5}$

(Ex) $\frac{2m^{-4}n^{-5}}{p^7} = \frac{2}{m^4 n^5 p^7}$

(Ex) $\left(\frac{4xy}{z}\right)^{-1} = \frac{z}{4xy}$

You try

① $(abc^3)(a^5b^{-1})$

② $(x^{-5}y^6z)^{-2}$

③ $\left(\frac{7xy^2}{z}\right)^2$

④ $\left(\frac{xy}{z^3}\right)\left(\frac{x^2y}{4}\right)^2$

(b) Fractional Exponents: when an exponent is a fraction, the numerator is the power of the base and the denominator is the index of the root.

$$a^{x/y} = \sqrt[y]{a^x} \quad \text{OR} \quad (\sqrt[y]{a})^x$$

$$\text{(Ex)} \quad x^{2/3} = \sqrt[3]{x^2} \quad \text{OR} \quad (\sqrt[3]{x})^2$$

$$\text{(Ex)} \quad 16^{1/4} = \sqrt[4]{16} = 2$$

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

$$\text{(Ex)} \quad (27 \text{ m}^3)^{1/3} = \sqrt[3]{27 \text{ m}^3} = 3 \text{ m}$$