Summary of Exponent Rules

Multiplication Rule

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

Ex) $(x^4y^3)(x^5y) = x^9y^4$

Ex) $8^3 \cdot 8^7 = 8^{10}$

Division Rule ($m > N$)

$$\frac{a^m}{a^N} = a^{m-N}$$

Ex) $\frac{x^8}{x^3} = x^5$

Ex) $\frac{5^{12}}{5^4} = 5^8$

Zero Exponent Rule

(Division Rule where $m = N$)

$$a^0 = 1$$

Except for $0^0 = 0$

Ex) $(4x^3y)^0 = 1$

Ex) $5^0 = 1$

Negative Exponent Rule

(Division Rule where $m < N$)

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

Ex) $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

Ex) $4x^{-3} = 4 \cdot \frac{1}{x^3} = \frac{4}{x^3}$

Never leave a negative exponent

Power To a Power Rule

$$(a^m)^N = a^{m \cdot N}$$

Ex) $(5^2)^5 = 5^{10}$

Ex) $\left[(4^3)^2\right]^6 = \left[4^6\right]^6 = 4^{36}$

Group To a Power Rule

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

OR

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

Ex) $(4x)^2 = 4^2x^2 = 16x^2$

Ex) $\left(\frac{2x}{y}\right)^3 = \frac{2^3x^2}{y^3} = \frac{8x^2}{y^3}$