

Rules for Exponents

Product Rule

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

$$2^3 \cdot 2^5 = 2^{3+5} = 2^8$$

$$y^4 \cdot y^2 = \cancel{y y y y} \cdot \cancel{y y} = y^6$$

Power Rule

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

$$(5^3)^4 = 5^{3 \cdot 4} = 5^{12}$$

$$(5^3 \times 5^3 \times 5^3 \times 5^3) = 5^{12}$$

$$\frac{a^m}{a^N} = a^{m-N} \quad \text{Quotient Rule}$$

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

$$3^{5-3} = 3^2 \quad \leftarrow$$

Zero exponents

$$a^0 = 1$$

$$(-3)^0 = 1$$

$$\left(\frac{m}{n} \dots\right)^0 = 1$$

$$-a^0 = -1$$

Negative Exponents

are inverses

$$b^{-1} = \frac{1}{b} \quad 2^{-1} = \frac{1}{2} \quad x^{-1} = \frac{1}{x}$$

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

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

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

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

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

$$\frac{1}{3^{-4}} = 3^4$$

$$6^{-3} = \frac{1}{6^3}$$

$$\frac{1}{7^{-2}} = 7^2$$

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