



Exponents

$$x^0 = 1 \text{ and } x^1 = x$$

$$\text{ex: } 5^0 = 1 \text{ and } 5^1 = 5$$

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

$$\text{ex: } x^3 \cdot x^2 \rightarrow x^{3+2} \rightarrow x^5$$

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

$$\text{ex: } \frac{x^5}{x^2} \rightarrow x^{5-2} \rightarrow x^3$$

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

$$\text{ex: } (x^5)^2 \rightarrow x^{5 \cdot 2} \rightarrow x^{10}$$

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

$$\text{ex: } x^{-3} \rightarrow \frac{1}{x^3} \text{ or } \frac{1}{x^{-4}} = x^4$$

$$\left(\frac{c}{x^m}\right)^n = \frac{c^n}{x^{m \cdot n}}$$

$$\text{ex: } \left(\frac{2}{x^5}\right)^3 \rightarrow \frac{2^3}{x^{5 \cdot 3}} \rightarrow \frac{8}{x^{15}}$$

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

$$\text{ex: } \sqrt{3} \rightarrow 3^{\frac{1}{2}} \text{ and } \sqrt[3]{5^2} \rightarrow 5^{\frac{2}{3}}$$

$$\text{If } a^r = a^s, \text{ then } r = s$$

$$\text{ex: } 3^x = 3^5, \text{ then } x = 5$$



Logarithms

$$\log_b x = y \text{ ex: } \log_3 x = 2$$

$$b^y = x \quad 3^2 = x$$

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$$\log_b x = y \quad \log_3 x = 2$$

$$\text{If } \log_b u = \log_b v, \text{ then } u = v$$

$$\text{ex: } \log_2 x = \log_2 7, \text{ then } x = 7$$

$$\log_b b = 1 \quad \text{ex: } \log_3 3 = 1$$

$$\log_b 1 = 0 \quad \text{ex: } \log_5 1 = 0$$

$$\log_b uv = \log_b u + \log_b v$$

$$\text{ex: } \log_2 7x = \log_2 7 + \log_2 x$$

$$\log_b \frac{u}{v} = \log_b u - \log_b v$$

$$\text{ex: } \log_3 \frac{2}{x} = \log_3 2 - \log_3 x$$

$$\log_b u^n = n \log_b u$$

$$\text{ex: } \log_4 x^3 = 3 \log_4 x$$

$$\log_b u = \frac{\log_c u}{\log_c b} \quad \text{ex: } \log_3 5 = \frac{\log_{10} 5}{\log_{10} 3}$$

$$b^{\log_b u} = u \quad \text{ex: } 3^{\log_3 5} = 5$$