Exponential and Logarithmic Properties

Exponential Properties:

1. Product of like bases: To multiply powers with the same base, add the exponents and keep the common base.
$$a^m a^n = a^{m+n}$$
2. Quotient of like bases: To divide powers with the same base, subtract the exponents and keep the common base.
$$\frac{a^m}{a^n} = a^{m-n}$$
3. Power to a power: To raise a power to a power, keep the base and multiply the exponents.
$$(a^m)^n = a^{mn}$$
4. Product to a power: To raise a product to a power, raise each factor to the power.
$$(ab)^m = a^m b^m$$
5. Quotient to a power: To raise a quotient to a power, raise the numerator and the denominator to the power.
$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$
6. Zero exponent: Any number raised to the zero power is equal to "1".
$$a^0 = 1$$
7. Negative exponent: Negative exponents indicate reciprocation, with the exponent of the reciprocal becoming positive. You may want to think of it this way: unhappy (negative) exponents will become happy (positive) by having the base/exponent pair "switch floors"!

$$a^{-n} = \frac{1}{a^n} \qquad or \qquad \frac{1}{a^{-n}} = a^n$$

Definition of the Logarithmic Function:

$log_a x = y$ ↔ $a^y = x$ The word "log" asks: What power do I put on 2 to get 8?

$log_2 8 = 3$ ↔ $2^3 = 8$ *Answer: 3*

Common Logarithm: The logarithm with base 10 is called the *Common Logarithm* and is denoted by omitting the base.	**Natural Logarithm:** The logarithm with base *e* is called the *Natural Logarithm* and is denoted by **'ln'.**
Properties: 1. $log_a(AB) = log_a A + log_a B$ 2. $log_a\left(\frac{A}{B}\right) = log_a A - log_a B$ 3. $log_a(A^c) = C \cdot log_a A$	**Change of Base:** This formula allows you to find the calculator value of the log of any base. $$log_b x = \frac{log_a x}{log_a b}$$

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