Understanding Log (Reading Material)

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What is log?

A logarithm is the inverse operation to exponentiation. For a given number x, the logarithm $\log_b(x)$ is the power to which the base b must be raised to obtain x.

Mathematically:

$\log_b(x) = y$

if and only if

$b^y = x$

For example:

$\log_2(8) = 3$

because $2^3 = 8$.

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Basic Properties of log

1. **Product Rule**:
   $$\log_b(xy) = \log_b(x) + \log_b(y)$$
2. **Quotient Rule**:
   $$\log_b\left(\frac{x}{y}\right) = \log_b(x) - \log_b(y)$$
3. **Power Rule**:
   $$\log_b(x^k) = k \cdot \log_b(x)$$
4. **Change of Base Formula**:
   $$\log_b(x) = \frac{\log_k(x)}{\log_k(b)}$$
   This is useful for converting between different bases.

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