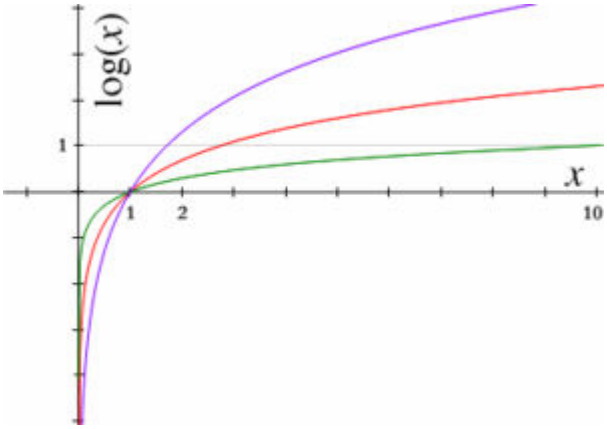
Logarithms

In mathematics, the **logarithm** of a number to a given base is the power or exponent to which the base must be raised in order to produce the number.

For example, the logarithm of 1000 to the base 10 is 3, because 10 raised to the power of 3 is 1000; the base 2 logarithm of 32 is 5 because 2 to the power 5 is 32.

For a number *x*, a base *b* and an exponent *y*,

$$\text{if } b^y = x, \text{ then } y = \log_b(x)\,.$$



Logarithm functions, graphed for various bases: red is to base *e*, green is to base 10, and purple is to base 1.7. Each tick on the axes is one unit. Logarithms of all bases pass through the point (1, 0), because any number raised to the power 0 is 1, and through the points (*b*, 1) for base *b*, because a number raised to the power 1 is itself. The curves approach the *y*-axis but do not reach it because of the singularity at *x* = 0.

Change of base

While there are several useful identities, the most important for calculator use lets one find logarithms with bases other than those built into the calculator (usually $\log_e$ and $\log_{10}$). To find a logarithm with base *b*, using any other base *k*:

$$\log_b(x) = \frac{\log_k(x)}{\log_k(b)}.$$

Moreover, this result implies that all logarithm functions (whatever the base) are similar to each other. So to calculate the log with base 2 of the number 16 with a calculator:

$$\log_2(16) = \frac{\log(16)}{\log(2)}.$$

http://en.wikipedia.org/wiki/Logarithm