Exponent Properties

In this paper, we'll assume the base, *b*, is positive and that *x* and *y* represent any real numbers. Here are the properties of exponents that you must know:

$b^0 = 1$, $b^1 = b$, $b^{-x} = \frac{1}{b^x}$

If *q* is any natural number (1, 2, 3, . . .), then $b^{\frac{x}{q}} = \sqrt[q]{b^x} = \left(\sqrt[q]{b}\right)^x$.

$b^x \; b^y = b^{x+y}$ $\frac{b^x}{b^b} = b^{x-y}$ $\left(b^x\right)^y = b^{xy}$

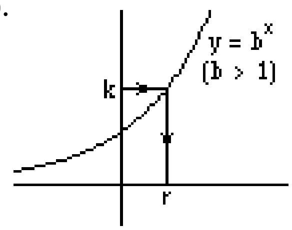
$b^x = b^y$ iff $x = y$. [Remember, this means if $b^x = b^y$, then $x = y$ and if $x = y$, then $b^x = b^y$]

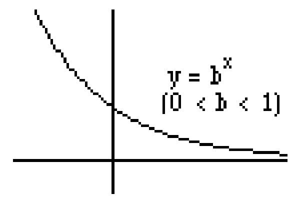
The graph of $y = b^x$ is continuous (so has no holes or jumps).

If *k* is any positive real number, then there is a real number *r* such that $b^r = k$.

If $b > 1$, the graph looks like the top picture at left.

If $0 < b < 1$, the graph looks likethe bottom picture at left.




Graphs of $y = b^x$ all contain the points (0,1), (1,b), $(2,b^2)$ $(-1, \frac{1}{b})$, etc.

The number *e* is defined to be the number that the sequence $\left(1 + \frac{1}{n}\right)^n$ is approaching as *n* gets larger and larger. This is also written $\lim_{n \to \infty}\left(1 + \frac{1}{n}\right)^n = e$.