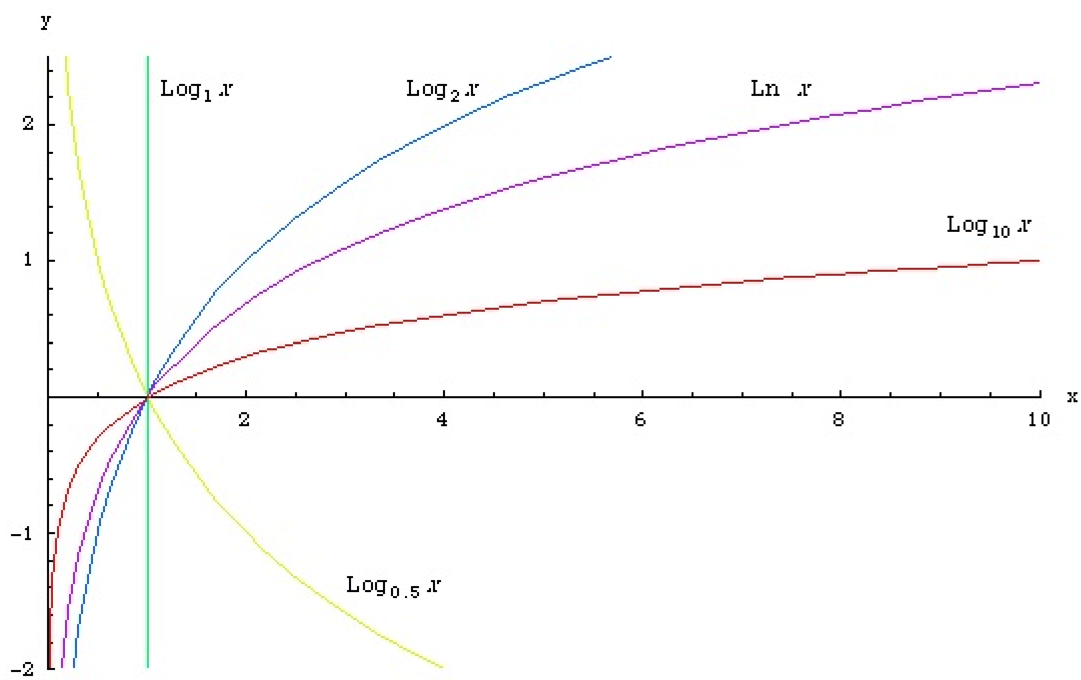
College Algebra: Module 12 What You Need To Know

3-28-15

1 Logarithms and Logarithmic Functions (Section 5.3)

Logarithm Function

$$f(x) = \log_b(x) \qquad\qquad b \neq 1 \text{ and } b > 0$$



We call b the **base** of the logarithm function.

There is a special kind of logarithm function that we single out becaue of its significance. It is the **Natural Log Function**. It is the function

$$f(x) = \ln(x)$$

The Natural Log Function is the logarithm function with **base e**:

$$f(x) = \log_e(x) = \ln(x)$$

and it is the **inverse** of the natural exponential function $f(x) = e^x$

Note: If you see something like $f(x) = \log(x)$ with no base, then we assume it is **log base 10**, or written out, we assume $f(x) = \log_{10}(x)$

Logarithm to Exponential Conversion:

$$y = \log_b(x) \Leftrightarrow x = b^y$$

Finding Domain of a Log Function:

Given $\log_b(\text{STUFF})$ we set STUFF > 0

Example: Find the domain of $\log_3(x - 3)$

- Set $x - 3 > 0 \implies x > 3$ is the domain

2 Properties of Logarithms (Section 5.4)

Important Properties of Logs:

1. $\log_b(1) = 0$
2. $\log_b(b) = 1$
3. $\log_b(b^x) = x$
4. $b^{\log_b(x)} = x$
5. $\log_b(x \cdot y) = \log_b(x) + \log_b(y)$
6. $\log_b\left(\frac{x}{y}\right) = \log_b(x) - \log_b(y)$
7. $\log_b(x^p) = p \cdot \log_b(x)$

Change of Base:

$$\log_b(M) = \frac{\log_a(M)}{\log_a(b)}$$