

## Logarithms and Log Properties

### Definition

$y = \log_b(x)$  is equivalent to  $x = b^y$

### Example

$\log_5(125) = 3$  because  $5^3 = 125$

### Special Logarithms

$\ln(x) = \log_e(x)$  natural log

$\log(x) = \log_{10}(x)$  common log

where  $e = 2.718281828\dots$

### Logarithm Properties

$$\log_b(b) = 1$$

$$\log_b(1) = 0$$

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

$$b^{\log_b(x)} = x$$

$$\log_b(x^r) = r \log_b(x)$$

$$\log_b(xy) = \log_b(x) + \log_b(y)$$

$$\log_b\left(\frac{x}{y}\right) = \log_b(x) - \log_b(y)$$

The domain of  $\log_b(x)$  is  $x > 0$