



5.4: Evaluate Logarithms and Graph Logarithmic Functions

Definition of Logarithm with Base b

Let b and y be positive numbers with $b \neq 1$. The logarithm of y with base b is denoted $\log_b y$ and is defined as follows:

$$\log_b y = x \quad \text{if and only if} \quad b^x = y$$

The expression $\log_b y$ is read as "log base b of y ."

Logarithmic Form

$$\log_2 8 = 3$$

$$\log_4 1 = 0$$

$$\log_5 25 = 2$$

Exponential Form

$$12^2 = 144$$

$$(1/4)^{-1} = 4$$

$$(3)^{-2} = 1/9$$



Examples) Evaluate the logarithms.

1) $\log_4 64$

2) $\log_2(16)$

3) $\log_{25}(5)$

Four logarithmic properties:

$$\log_b 1 =$$

$$\log_b b =$$

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

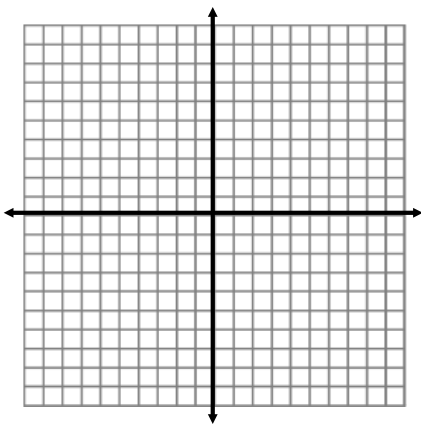
$$\log_b b^x =$$



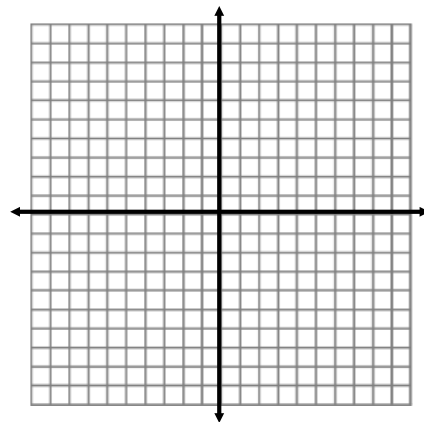
Common Logarithm vs. Natural Logarithm

Graphs of Logarithmic Functions:

$$f(x) = \log_b(x)$$



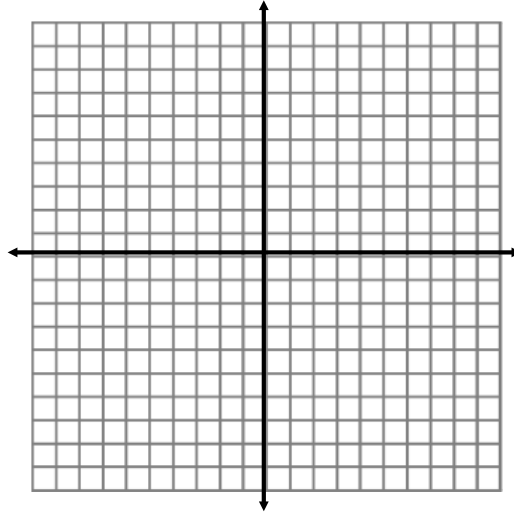
$$f(x) = \ln(x)$$





How are Logarithmic Functions and Exponential Functions related?

Consider the exponential function $y = 2^x$
and the logarithmic function $y = \log_2 x$.



How do you evaluate logarithms using your calculator?