

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:

<p>_____ if and only if _____</p>	<p>The expression $\log_b y$ is read as....</p>
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Rewrite each of the following from Logarithmic form to exponential form.

1) $\log_2 8 = 3$

2) $\log_4 1 = 0$

3) $\log_5 25 = 2$

Rewrite each of the following from exponential form to logarithmic form.

1) $12^2 = 144$

2) $\left(\frac{1}{4}\right)^{-1} = 4$

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

Evaluate the logarithms.

1) $\log_4 64 =$

2) $\log_2 16 =$

3) $\log_5 125 =$

4) $\log_3 243 =$

5) $\log_8 1 =$

6) $\log_{25} 5 =$

7) $\log_9 0 =$

8) $\log_4 \left(\frac{1}{16}\right) =$

9) $\log_{64} \left(\frac{1}{4}\right) =$

Logarithmic Properties
$\log_b 1 =$
$\log_b b =$
$b^{\log_b x} =$
$\log_b b^x =$

Change of Base Formula:

Example)

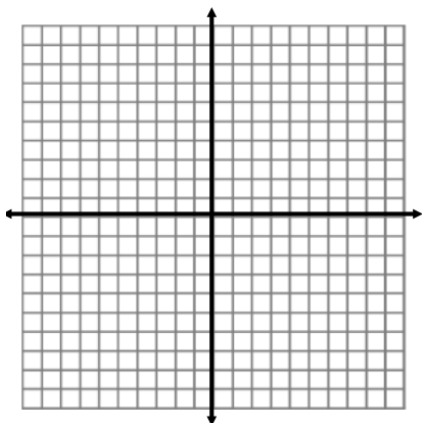
Evaluate $\log_6 12 =$

Common Logarithm vs. Natural Logarithm

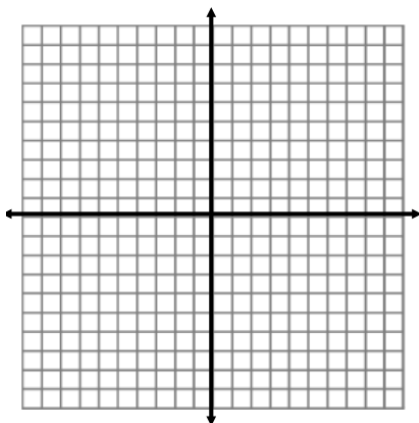
Common Logarithm	Natural Logarithm
<p>Evaluate:</p> <p>$\log(10) =$</p> <p>$\log(100) =$</p> <p>$\log(1/10) =$</p>	<p>Evaluate:</p> <p>$\ln(e) =$</p> <p>$\ln(e^2) =$</p> <p>$\ln(e^{-8}) =$</p>

Parent Graphs and Transformation Graphs of Logarithms

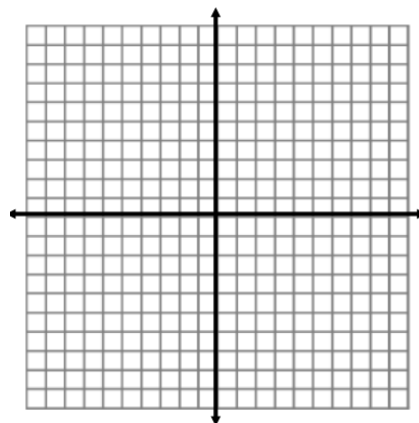
$$f(x) = \log_b x$$



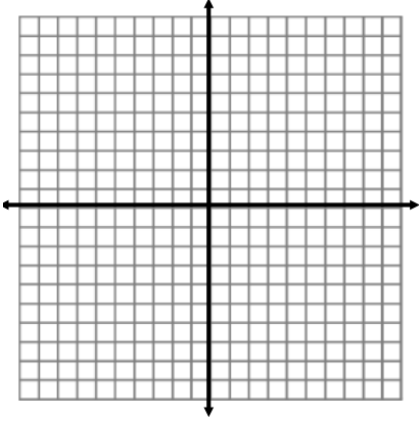
$$f(x) = \log_2 x$$



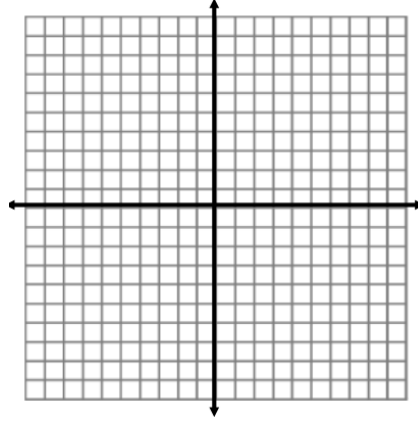
$$f(x) = \ln(x)$$



$$f(x) = 2\ln(x - 4)$$



$$f(x) = -\log_2 x - 6$$



$$f(x) = \log_5(x + 1) + 3$$

