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Lesson 4.3: Logarithmic Functions

Logarithmic Functions

Let a be a positive number with $a \neq 1$. The logarithmic function with base a, denoted by log_a , is defined by:

Logarithmic Form	Exponential Form

*__Note:__ In both the _____________________ and ____________________ form the base is the ________________ . Both the logarithmic and exponential form are equivalent equations.

Properties of Logarithms

Property	**Reason**

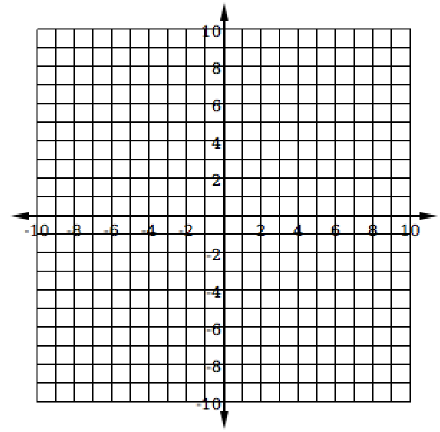
Graphing Logarithms

A logarithmic function is the __________________ of an exponential function. This is because our x and y switch places (meaning we swap our domain and range).

Example: Sketch the graph of $f(x) = \log_2(x)$ and $f(x) = 2^x$ on the same set of axes.

x	$\log_2(x)$
2^3	
2^2	
2	
1	
2^{-1}	
2^{-2}	
2^{-3}	
2^{-4}	

x	2^x
3	
2	
1	
0	
-1	
-2	
-3	
-4	



What's My Base?

Whenever you see a logarithm written and the base is ________________ , the logarithm's base is _____ . This is called the **common logarithm**.

$$\log x = \log_{10} x$$

Natural Logarithms

Natural logarithms are logarithms with a base of _____ . It is denoted by **ln**.

$$\ln x = \log_e x$$

The natural logarithm function is the inverse of the natural exponential function ($y = e^x$).

Properties of Natural Logarithms

Property	**Reason**

Examples: Evaluate the following logarithms.

1. $\ln(e^8) =$

2. $\ln\left(\frac{1}{e^2}\right) =$

3. $\log_5(5) =$