Logarithms Tool Sheet **Name:**

Vocabulary

Logarithm – The exponent,____, to which the base ____, must be raised to equal ____, written as

Example:

Logarithmic form – An expression or an equation containing logarithms.

Example: The equation _____ is the logarithmic form of the exponential equation _____.

Common Logarithm – A logarithm to base 10. The common logarithm of ____ is written _____. For example,

_____ since _____.

***e* (Eulor's number)** – The base of the natural logarithm; a number commonly encountered when working with exponential functions to model growth, decay, continuously compounded interest. It is an irrational number.

$e \approx$

Natural Logarithm – A logarithm to base *e*, where *e* is an irrational constant approximately equal to 2.718281828459.

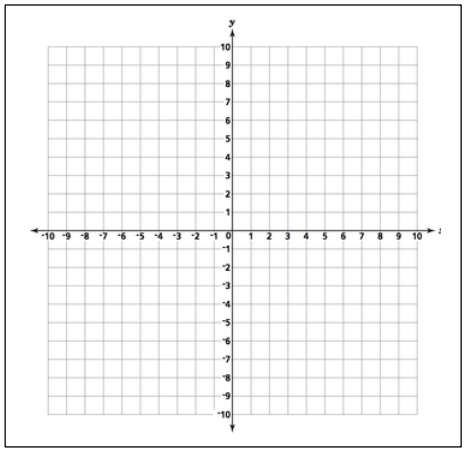
Example:

Logarithmic & Exponential Functions as Inverses

In mathematics, an **inverse** function is a function that "reverses" another function. A logarithmic function is the **inverse** of an exponential function and vice versa. Find the inverse of the following functions.

$f(x) = 2^x$

$f^{-1}(x) = \log_2 x$



x	$f(x)$

$f(x) = 2^x$

x	$f^{-1}(x)$

$f^{-1}(x) = \log_2 x$

Find the inverse of the following functions.

$f(x) = 3^x$ $f(x) = \log_{0.5} x$ $f(x) = 3^{2x}$ $f(x) = \log_4 5x$

$f^{-1}(x) =$ $f^{-1}(x) =$ $f^{-1}(x) =$ $f^{-1}(x) =$

Log Rules

Product Rule	**Quotient Rule**	**Power Rule**
$\log_b xy = \log_b x + \log_b y$	$\log_b \frac{x}{y} = \log_b x - \log_b y$	$\log_b x^y = y \log_b x$
Expand: $\log_3 5x =$	**Expand:** $\log_2 \frac{a}{6} =$	**Expand:** $\log q^4 =$
Simplify: $\log_4 7 + \log_4 n =$	**Simplify:** $\ln x - \ln 9 =$	**Simplify** $5 \ln a =$
Change of Base Formula	**Log of the Base Rule**	**Log of 1 Rule**
$\log_b x = \frac{\log x}{\log b}$	$\log_b b = 1 \quad \ln e = 1$	$\log_b 1 = 0 \quad \ln 1 = 0$
$\log_2 8 =$	$\log_{102} 102 =$	$\log_{35} 1 =$

Solving Logarithmic Equations

Solve for x

$3\log(x+4) = 6$	$\ln x = 4$
$\log_5(x+1) = 2$	$2\ln(3x) = 18$
$\log_9 x + \log_9(x-8) = 1$	$\ln(2x-3) + \ln(x+4) = \ln(2x^2+11)$
$\ln(2x+4) = x^2$	$\log(4p-2) = \log(-5p+5)$