Intro to Logarithms

Definition

The base-b logarithm of n is defined to be the number p for which $b^p = n$. In other words,

$\log_b n = p$	if and only if	$b^p = n$

1. Complete the following table. If given a logarithmic equation, write the equivalent exponential equation. If an exponential equation is given, produce the equivalent logarithmic equation.

Logarithmic form	$\log_2 8 = 3$	$\log_5 (125) = 3$	$\log_3 x = 3$	$\log x = 2$			
Exponential form	$2^3 = 8$	$5^3 = 125$			$10^x = 6$	$e^y = 6$	$b^0 = 1$

Special Bases

Common log (base 10)

$$\log_{10} x =$$

Natural log (base e)

$$\log_e x =$$

Using the Calculator

2. Use your calculator to evaluate the logarithms

a. $\ln 3 =$

b. $\frac{\ln 20 - \log 3}{\log 20 + \ln 3} =$

c. $\frac{\ln 4 + 3}{9} =$

d. $e^{\frac{\ln 16 - \ln 4}{\log 100}} =$

Without the Calculator

3. Use the definition to find the value of the following logs without a calculator:

a. $\log_8 8$

b. $\log_6 1$

c. $\log_3 81$

d. $\log_5 \left(\frac{1}{25}\right)$

e. $\ln e^3$

f. $\log_2 8$

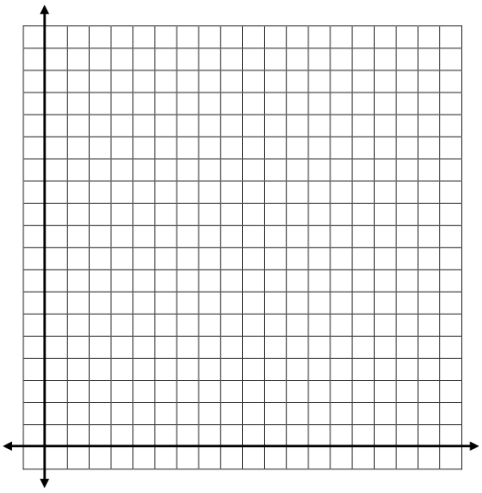
g. $\log 100$

h. $\log_{\frac{1}{3}} 27$

i. $\log_3 \frac{1}{27}$

Inverses

4. Graph $f(x) = 2^x$ and it's inverse $f^{-1}(x) = \log_2 x$ on your calculator. Compare their domains and ranges. Do you remember the relationship between the domains and ranges of inverse functions?

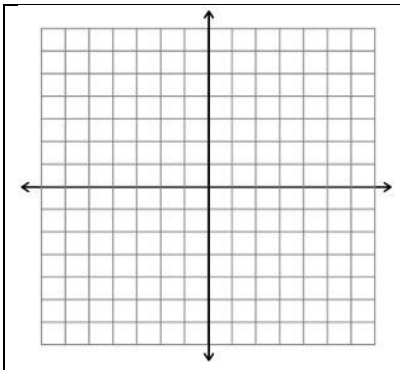


x	$f(x) = 2^x$
-1	
0	
1	
2	

x	$f^{-1}(x) = \log_2 x$
$\frac{1}{2}$	
1	
2	
4	

Graphing Log Functions

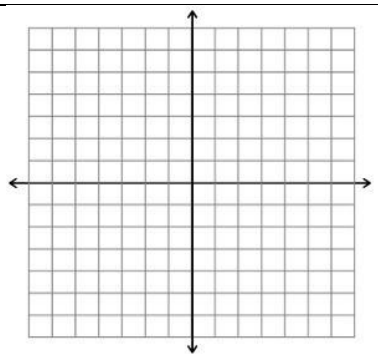
Plot two points and the asymptote. (Protip: choose values of x that make the argument equal to the base and equal to 1). Then find domain and range.



x	$f(x) = \log_{\frac{1}{2}} x$
1	
½	

Domain:

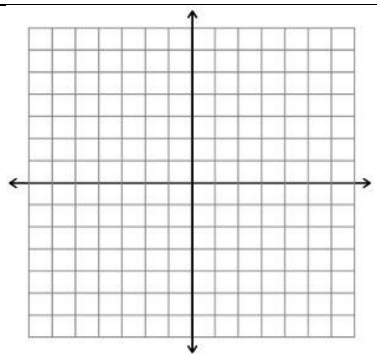
Range: $(-\infty, \infty)$



x	$f(x) = -\log_2 x - 1$
1	
2	

Domain:

Range: $(-\infty, \infty)$



x	$f(x) = \log_3(x - 2)$
3	
5	

Domain:

Range: $(-\infty, \infty)$