MATH 125 College Algebra Name_____

Logarithmic Functions are inverse functions of an exponential function thus $f(x)=b^x$ and $g(x)=\log_b(x)$

Evaluate each expression

1) $\log_{10} 1000$ 2) $\log_9 27$ 3) $\log_{16}\left(\frac{1}{8}\right)$

$x=(b)^y$

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

Note: $b>0$ *and* $b\neq 1$

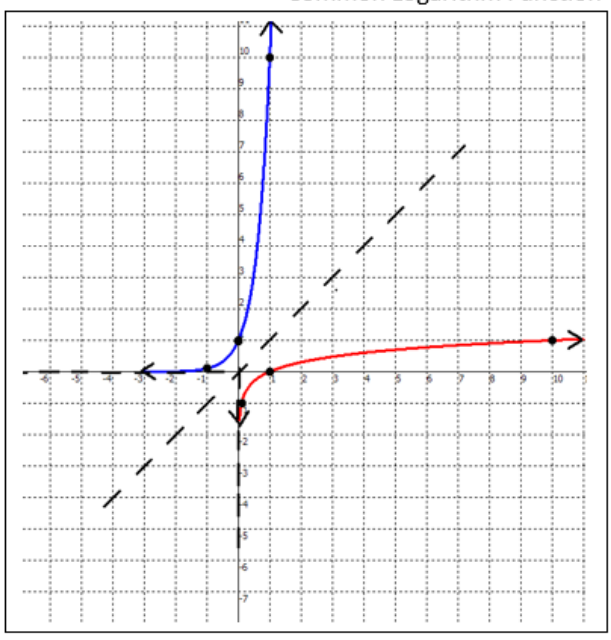
- They are continuous functions over $(0,\infty)$
- They are One – to – One Functions
- Domain: $(0,\infty)$ All real Numbers greater than Zero
- Range: $(-\infty,\infty)$ All Real Numbers
- Increasing function if $b>1$
- Decreasing function if $0<b<1$
- As $x\to 0^+$ the y-axis is a vertical asymptote for the graph of the function.
- The graph of the function has an x-intercept: (1, 0)
- The graph of the function does not have a y-intercept.

Key points of the graph also include: $(b,1)$ & $\left(\frac{1}{b},-1\right)$

$g(x)=10^x$

$g^{-1}(x)=\log_{10}(x)$ $g^{-1}(x)=\log(x)$

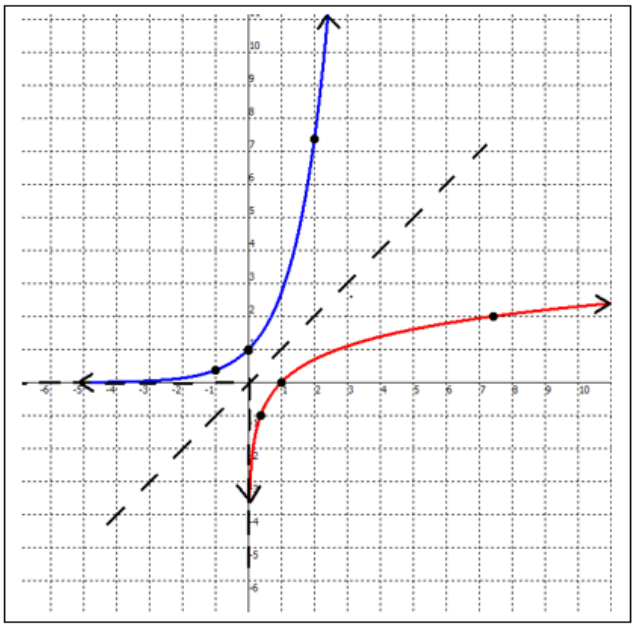
Common Logarithm Function



$g(x)=e^x$

$g^{-1}(x)=\log_e(x)$ $g^{-1}(x)=\ln(x)$

Natural Logarithm Function



$y = \log_b(x)$

x	y
$\frac{1}{b^2}$	-2
$\frac{1}{b}$	-1
1	0
b	1
b^2	2
$x=0$	*Asym*

$y = \log_2(x)$

x	y
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2
$x=0$	*Asym*

$y = \log_{10}(x) = \log(x)$

x	y
$\frac{1}{100}$	-2
$\frac{1}{10}$	-1
1	0
10	1
100	2
$x=0$	*Asym*

$y = \log_e(x) = \ln(x)$

x	y
$\approx \frac{1}{7.4}$	-2
$\approx \frac{1}{2.7}$	-1
≈ 1	0
≈ 2.7	1
≈ 7.4	2
$x=0$	*Asym*

$y = \log_{1/2}(x)$

x	y
4	-2
2	-1
1	0
$\frac{1}{2}$	1
$\frac{1}{4}$	2
$x=0$	*Asym*

$y = \log_{1/3}(x)$

x	y
9	-2
3	-1
1	0
$\frac{1}{3}$	1
$\frac{1}{9}$	2
$x=0$	*Asym*

$y = \log_{3/4}(x)$

x	y
$\frac{16}{9}$	-2
$\frac{4}{3}$	-1
1	0
$\frac{3}{4}$	1
$\frac{9}{16}$	2
$x=0$	*Asym*

$y = a \cdot \log_b(x+n)+m$

$-n$ [x | y] $\cdot a$] $+m$

x	y
$\frac{1}{b^2}$	-2
$\frac{1}{b}$	-1
1	0
b	1
b^2	2
$x=0$	*Asymptote*

$y = \log_{1/2}(x-3)-6$

$+3$ [x | y] -6

	x	y	
7	4	-2	-8
5	2	-1	-7
4	1	0	-6
$3\frac{1}{2}$	$\frac{1}{2}$	1	-5
$3\frac{1}{4}$	$\frac{1}{4}$	2	-4
$x=3 \leftarrow x=0$			*Asymptote*