

## Graphing LOGS

Example 1:

1. Find the inverse of  $f(x) = 2^x$  (find  $f^{-1}(x)$ )

$$y = 2^x$$

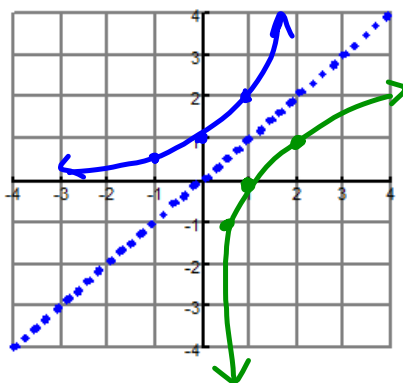
$$x = 2^y$$

$$\log_2 x = y$$

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

2. Graph  $f(x) = 2^x$  and  $f^{-1}(x)$  on the same graph.

x	$f(x) = 2^x$
-1	.5
0	1
1	2



x	$f^{-1}(x) = \log_2 x$
1/2	-1
1	0
2	1

Example 2:

1. Find the inverse of  $f(x) = 3^x$  (find  $f^{-1}(x)$ )

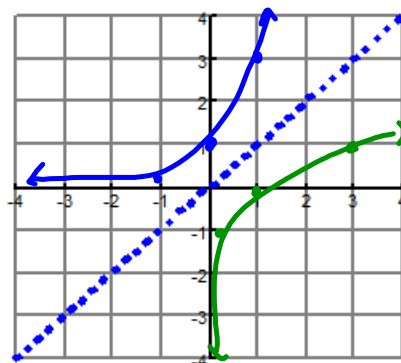
$$y = 3^x$$

$$x = 3^y$$

$$\log_3 x = y$$

2. Graph  $f(x) = 3^x$  and  $f^{-1}(x)$  on the same graph.

x	$f(x) = 3^x$
-1	.33
0	1
1	3



x	$f^{-1}(x) = \log_3 x$
<del>1/3</del> .33	-1
1	0
<del>3</del> 3	1

When you graph a log function you can easily find three points and graph if you can remember these things:

If  $f(x) = \log_a(x)$

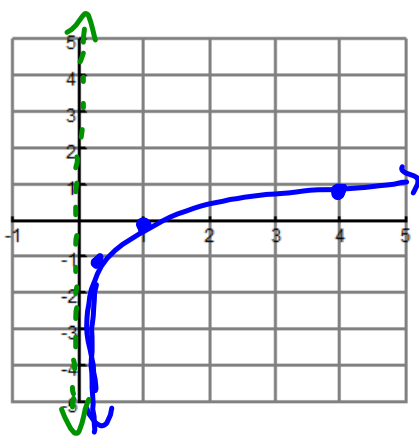
- Asymptote:  $X=0$

- | x             | y  |
|---------------|----|
| $\frac{1}{a}$ | -1 |
| 1             | 0  |
| a             | 1  |

x	y
$\frac{1}{a}$	-1
1	0
a	1

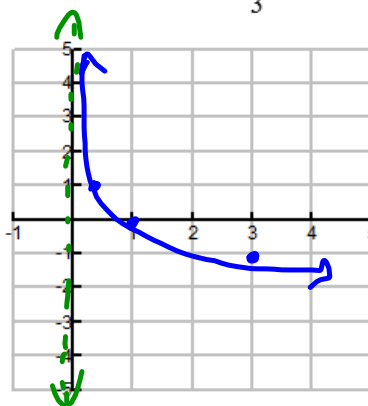
Graph each one of these by using the above asymptote and 3 ordered pairs.

a.)  $f(x) = \log_4 x$



$$\begin{array}{r|l} \frac{1}{4} & -1 \\ 1 & 0 \\ 4 & 1 \end{array}$$

b.)  $f(x) = \log_{\frac{1}{3}} x$



$$\begin{array}{r|l} \frac{1}{3} & -1 \\ 1 & 0 \\ 3 & 1 \end{array}$$

## Transformations of Logs

Parent function is  $f(x) = a \cdot \log_b(x - h) + k$

a

- $|a| > 1$  Stretch
- $0 < |a| < 1$  Shrink
- If the value of a is negative, then reflection over x-axis

h

- If  $\log(x+h)$ , then it moves the asymptote/graph left
- If  $\log(x-h)$ , then it moves the asymptote/graph

~~left~~ Right

k

- If k is positive shift graph up
- If k is negative shift graph down

Asymptote  $x = h$

State the transformation of the following and identify the asymptote  $f(x) = \log_a(x)$

a.)  $f(x) = \log_a(x+2)$  left 2

Asymptote:  
 $x = -2$

b.)  $f(x) = \log_a(x) + 2$  up 2

$x = 0$

c.)  $f(x) = -\log_a(x)$  Reflect over x-axis

$x = 0$

d.)  $f(x) = \log_a(-x)$  Reflect over y-axis

$x = 0$

e.)  $f(x) = \log_a(x-3) + 4$  Right 3  
up 4

$x = 3$

f.)  $f(x) = 2\log_a(x+5) - 11$  stretch by factor of 2  
Left 5  
down 11

$x = -5$

a.)  $f(x) = \log_3(x+2)$

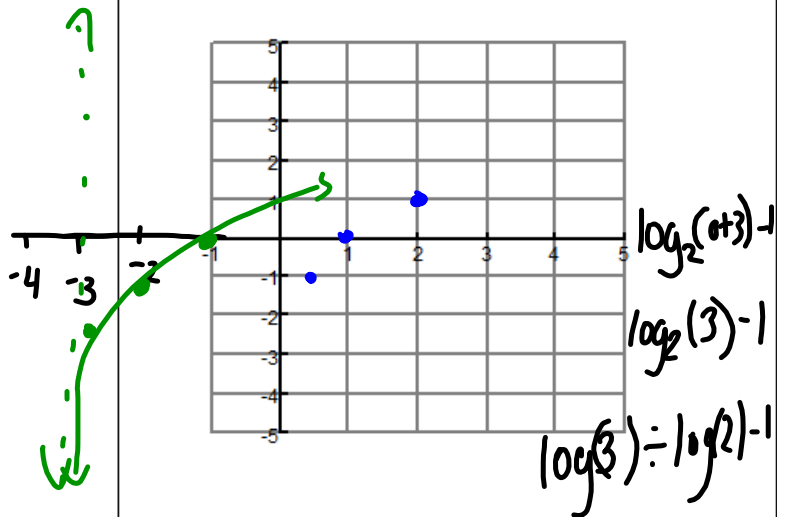
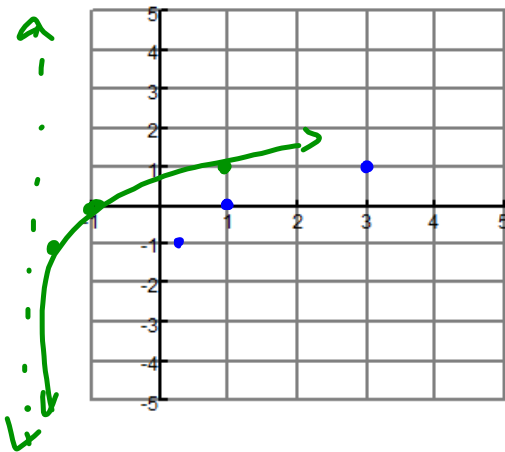
Asymptote  $x = -2$ x-intercept  $(-1, 0)$ y-intercept  $(0, .63)$ 

$\frac{1}{3}$	-1
1	0
3	1

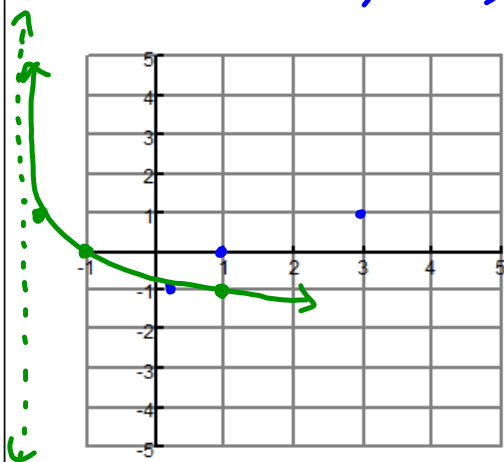
b.)  $f(x) = \log_2(x+3) - 1$

Asymptote  $x = -3$ x-intercept  $(-1, 0)$ y-intercept  $(0, .58)$ 

$\frac{1}{2}$	-1
1	0
2	1



c.)  $f(x) = -\log_3(x+2)$

Asymptote  $x = -2$ x-intercept  $(-1, 0)$ y-intercept  $(0, -.63)$ 

d.)  $f(x) = \log_2(x) - 1$

Asymptote  $x = 0$ x-intercept  $(2, 0)$ y-intercept N/A