

7-4 Graphing Logarithmic Functions

Objectives:

1. I can identify the transformations performed on a logarithmic function.
2. I can graph a logarithmic function by hand.
3. I can identify the asymptote of a logarithmic function.

Logarithms & Exponentials

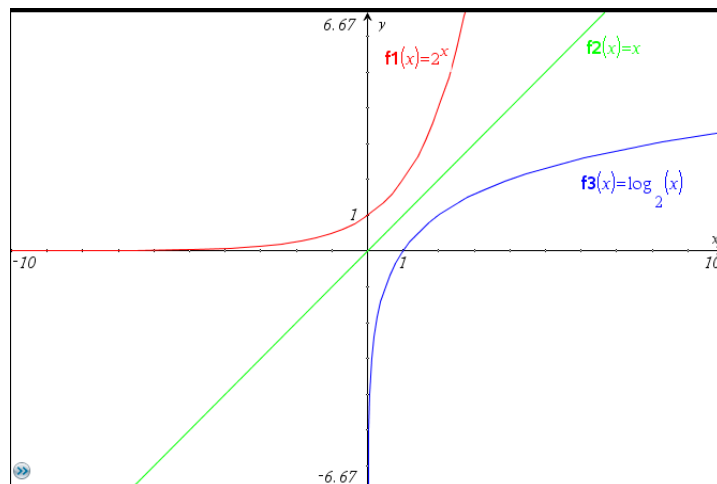
$f(x) = 2^x$ & $f(x) = \log_2 x$ are inverses

$$x = 2^y$$

$$y = \log_2 x$$

to find inverse:

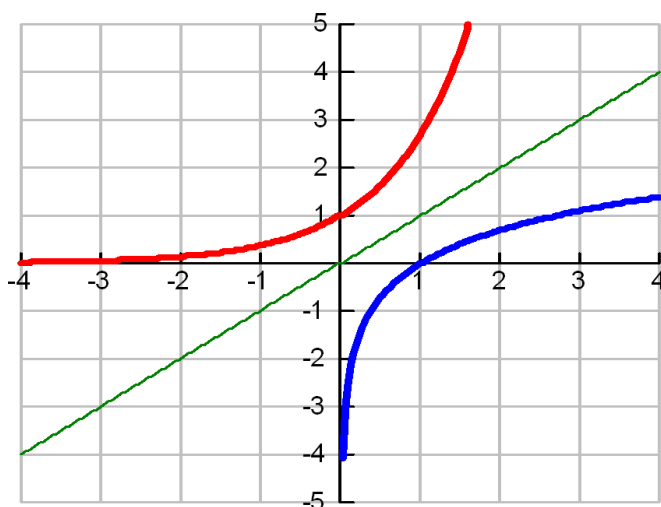
1. switch x&y
2. solve for y



natural log

$$f(x) = \ln x$$

$$f(x) = e^x$$

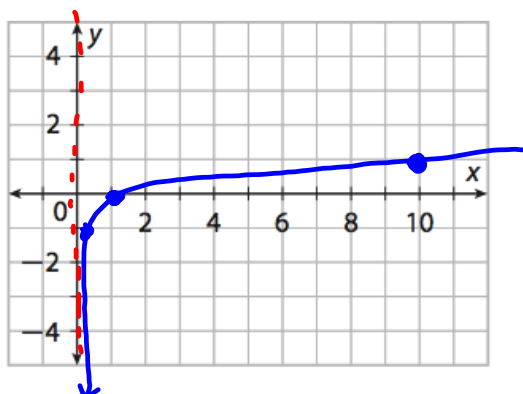


Complete the table for the function $f(x) = \log x$

Then plot the points on the graph and connect the dots.

x	$f(x) = \log x$
0.1	-1
1	0
10	1

$$10^{-1} = 0.1$$
$$10^0 = 1$$
$$10^1 = 10$$

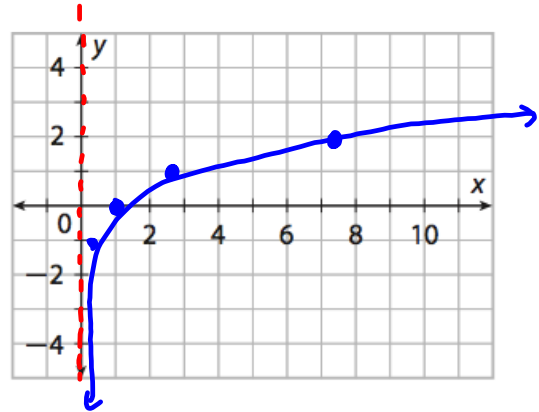


Complete the table for the function $f(x) = \ln x$

Then plot the points on the graph and connect the dots.

x	$f(x) = \ln x$
$\frac{1}{e} \approx 0.368$	-1
1	0
$e \approx 2.72$	1
$e^2 \approx 7.39$	2

$$\begin{aligned} e^{-1} &= \frac{1}{e} \\ e^0 &= 1 \\ e^1 &= e \\ e^2 &= e^2 \end{aligned}$$



Transformations:

$\log(x) + k$: Shift Up/Down

$\log(x-h)$: Shift Left/Right
(x's lie!)

$a \cdot \log(x)$: V. Stretch

$-\log(x)$: V. Flip

Describe the transformations on each graph:

$$f(x) = \log(x + 2) \quad \text{Shift Left 2}$$

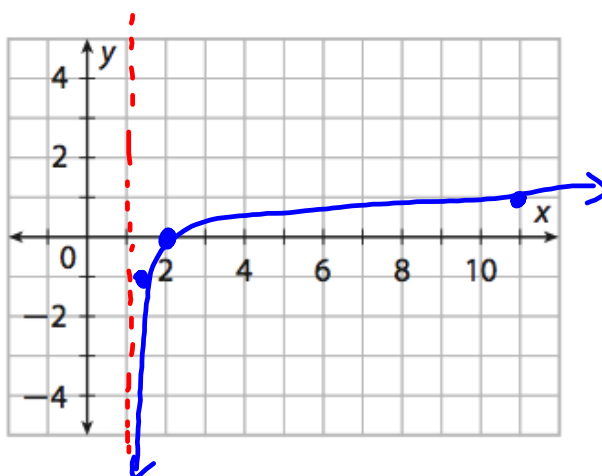
$$f(x) = 3\log(x) - 4 \quad \begin{array}{l} \text{V. Stretch by 3} \\ \text{Shift Down 4} \end{array}$$

$$f(x) = -2\ln(x) + 5 \quad \begin{array}{l} \text{V. Flip} \\ \text{V. Stretch by 2} \\ \text{Shift up 5} \end{array}$$

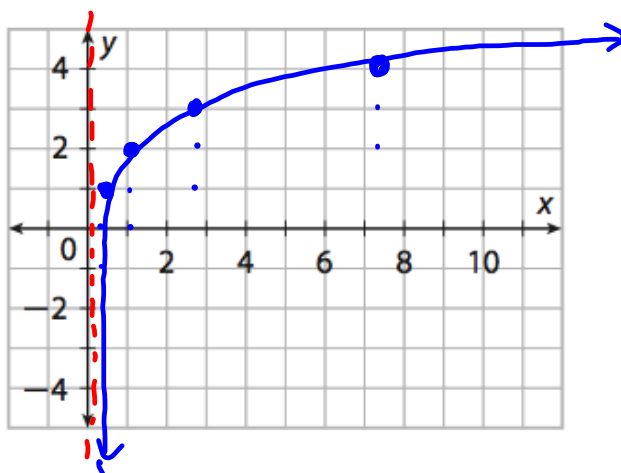
Graph

$$f(x) = \log(x - 1)$$

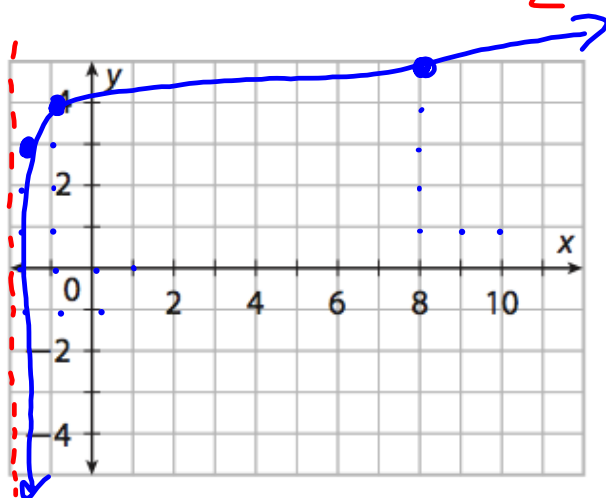
Shift Right 1



Graph $f(x) = \ln(x) + 2$ Shift up 2



Graph $f(x) = \log(x + 2) + 4$ $\uparrow 4$
 $\leftarrow 2$



Graph $f(x) = \ln(x + 2) - 3$

$\leftarrow 2$ $\downarrow 3$

