9-4 Graphing Logarithmic Functions

Objectives:

1. I can identify the transformations performed on a logarithmic function.

2. I can graph a logarithmic function by hand.

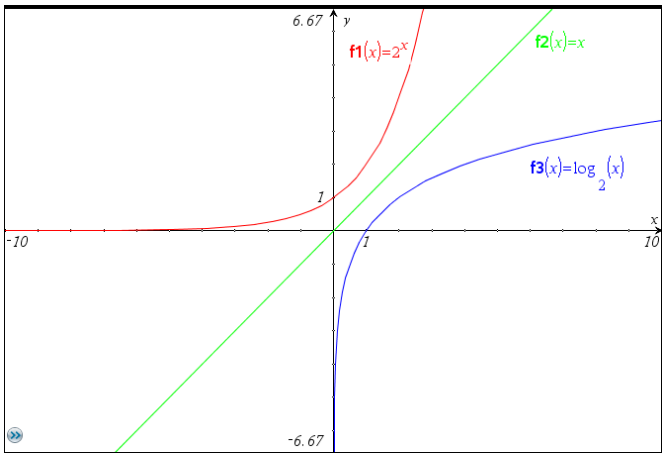
3. I can identify the asymptote of a logarithmic function.

Logarithms & Exponentials

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

to find inverse:

1. switch x&y
2. solve for y



Describe the transformations on each graph:

$f(x) = \log(x+2)$ Shift Left 2

$f(x) = 3\log(-x) - 4$

- V. Stretch (multiply) by 3
- Shift Down 4
- H. Flip

$f(x) = -2\ln(2x) + 5$

- V. Flip
- Shift up by 5
- V. Stretch by 2
- H. Stretch by 1/2

Graphing Transformed Logarithmic Functions

When graphing a transformed function, it is helpful to consider the following features of the graph: the vertical asymptote, and two reference points (1,0) and (b,1).

Function	$f(x) = \log_b x$	$g(x) = a\log_b(x-h)+k$
Asymptote	$x = 0$	$x = h$
Reference point	$(1, 0)$	$(1+h, k)$
Reference point	$(b, 1)$	$(b+h, a+k)$

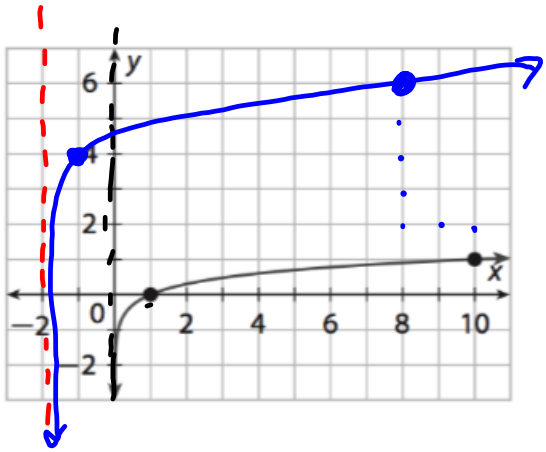
List the transformations, then graph.

$g(x) = 2\log(x+2) + 4$

V. Stretch by 2

Shift Left 2 ← VA: x = -2

Shift Up 4



transformations of the graph of $f(x) = \log_b x$ that produce the graph of nction $g(x)$. Then graph $g(x)$ on the same coordinate plane as the graph pplying the transformations to the asymptote $x = 0$ and to the reference) and $(b, 1)$. Also state the domain and range of $g(x)$ using set notation.

$\frac{1}{2}\log_2(x+1)+2$

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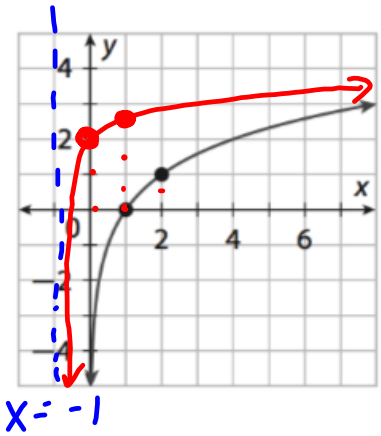
- V. Stretch by $\frac{1}{2}$ (Compression)
- Left by 1
- Up 2

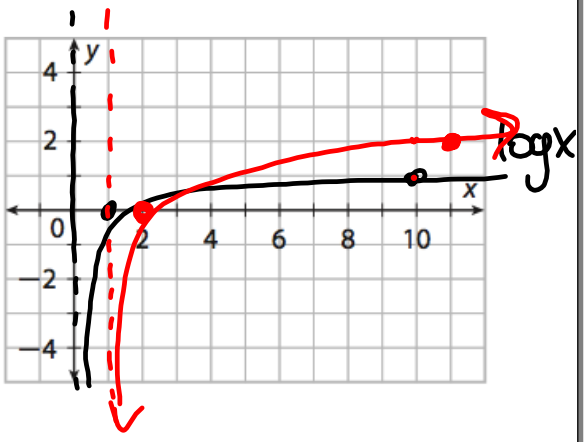


Graph and analyze the following functions:

$f(x) = 2 \cdot \log(x-1)$

V. Stretch
· Right 1

- **Domain:** $(1, \infty)$ VA
- **Range:** $(-\infty, \infty)$
- **End behavior:** X



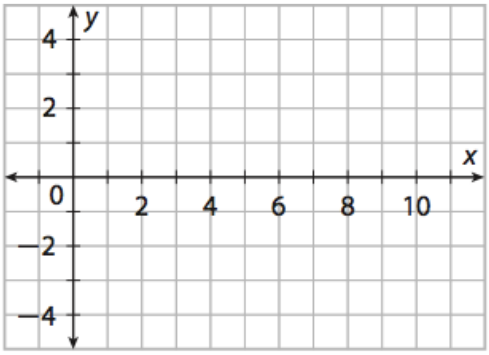
- **Vertical Asymptote:** $x = 1$
- **Increasing:** $(1, \infty)$
- **Decreasing:** X
- **Intercepts:**

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

Domain:

Range:

End behavior:



Vertical Asymptote:

Increasing:

Decreasing:

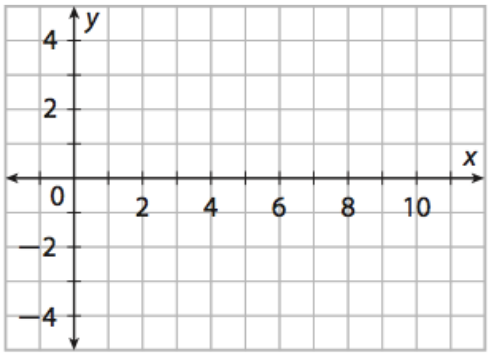
Intercepts:

$$f(x) = 3 \cdot \ln(x) + 2$$

Domain:

Range:

End behavior:



Vertical Asymptote:

Increasing:

Decreasing:

Intercepts: