5-4 Graphing Logarithmic Functions

Objectives:

5-4a: I can graph a logarithmic equations using transformations and points.

5-4b: I can identify the asymptote of a logarithmic function.

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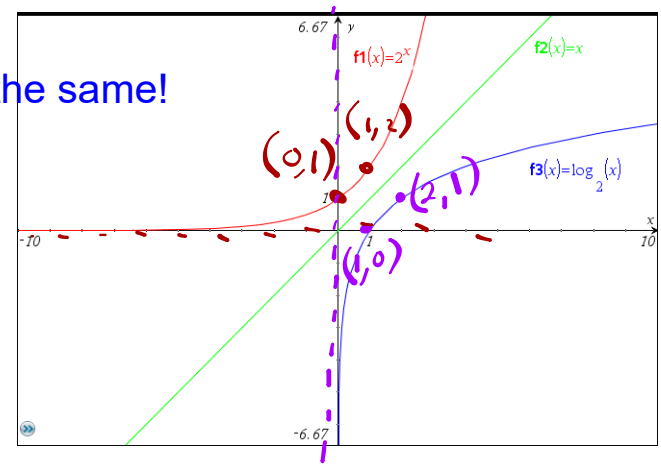
Logarithms & Exponentials

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

Notice the bases are the same!



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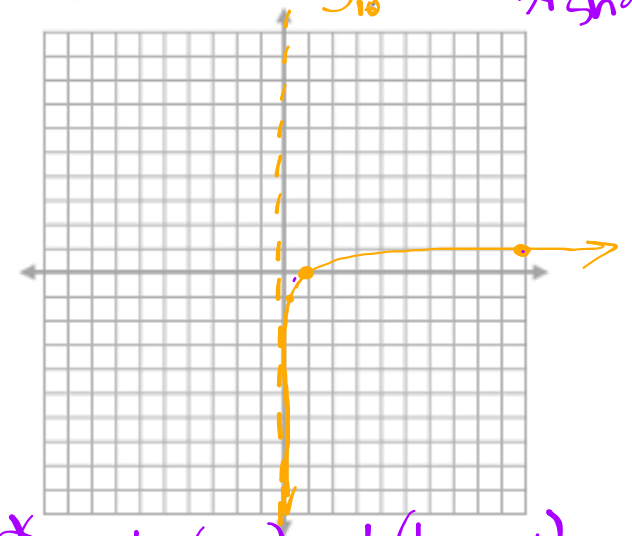
x	$f(x)$
0	und
$1/10$	-1
1	0
10	1

$f(x) = \log_{10} 10$

*shape



*asymp: $x=0$

*Key pts: (1,0) and (base,1)

Describe the transformations on each graph:

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

left 2

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

down 4
Vert str of 3

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

vert flip
vert str of 2
right 5

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).

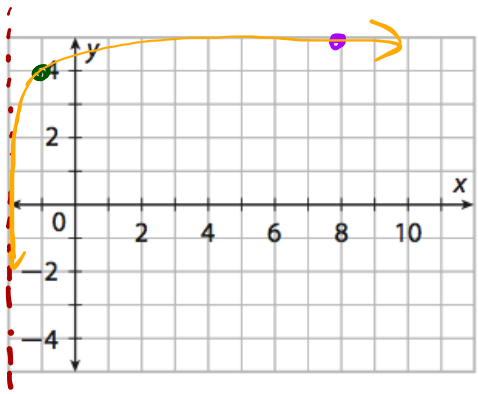
Function	$f(x) = \log_b x$	$g(x) = a \log_b (x - h) + k$
Asymptote	$x = 0$	$x = h$
Reference point	$(1, 0)$	$(1 + h, k)$
Reference point	$(b, 1)$	$(b + h, a + k)$

1) Move asymptote from x = 0
2) Move ref. pt. from (1,0)
3) Move ref. pt. from (b,1)
4) Draw graph

List the transformations, then graph.

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

vert stretch of 2
left 2
up 4



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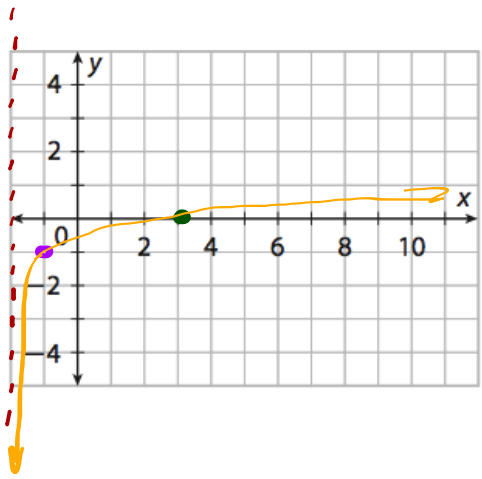
Graph the logarithmic function.

$$f(x) = \log_5(x + 2) - 1$$

asymp: x = -2

(1,0) → left 2 down 1
(-1,-1)

(5,1) → left 2, down 1
(3,0)



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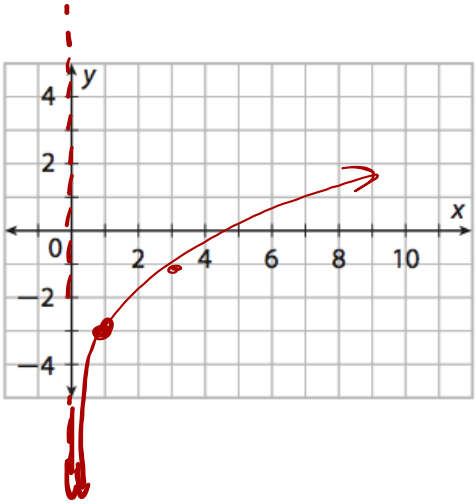
Graph the logarithmic function.

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

asymp: $x = 0$



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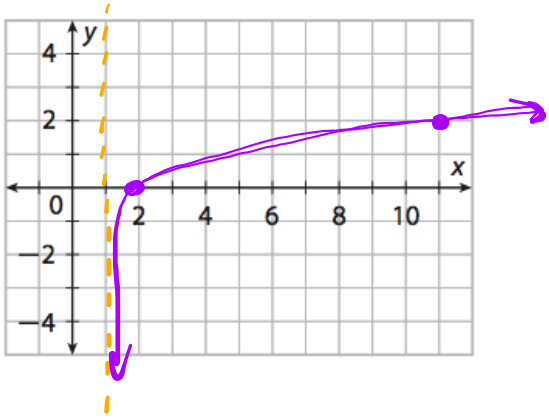
Graph and analyze the following functions:

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

Domain:

Range:

End behavior:



Vertical Asymptote: $x = 1$

Increasing:

Decreasing:

Intercepts:

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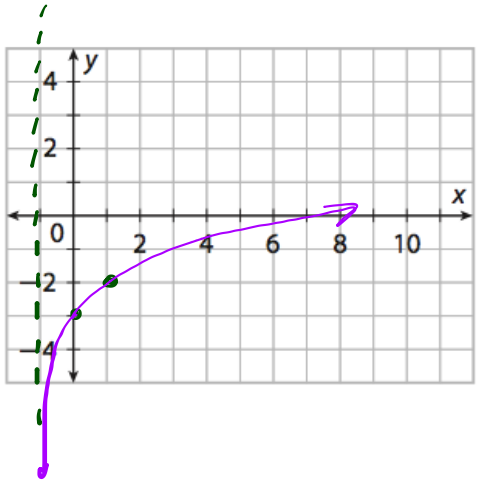
$$f(x) = \log_2(x+1) - 3$$

Domain:

Range:

End behavior:



Vertical Asymptote: $x = -1$

Increasing:

Decreasing:

Intercepts:

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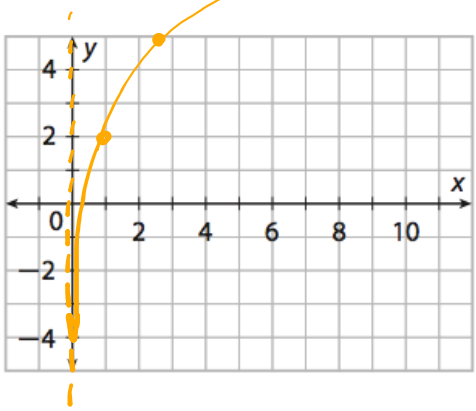
$$f(x) = 3 \cdot \ln(x) + 2$$

Remember!
ln has a base of e
and $e \approx 2.7$

Domain:

Range:

End behavior:



Vertical Asymptote: $x = 0$

Increasing:

Decreasing:

Intercepts:

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