Welcome!

-Please place cell phones in holder.

Time for a quick check!

Graphing LOGS

Example 1:

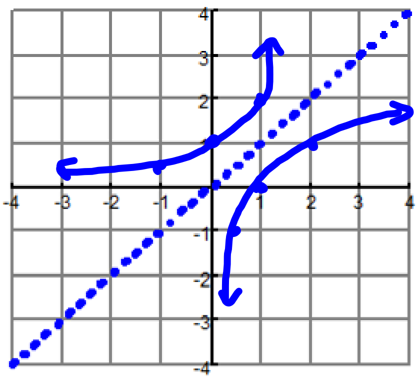
1. Find the inverse of $f(x)=2^x$ (find $f^{-1}(x)$)

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

$y = 2^x$
$x = 2^y$
$\log_2 x = y$

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

x	$f(x)=2^x$
-1	1/2
0	1
1	2



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

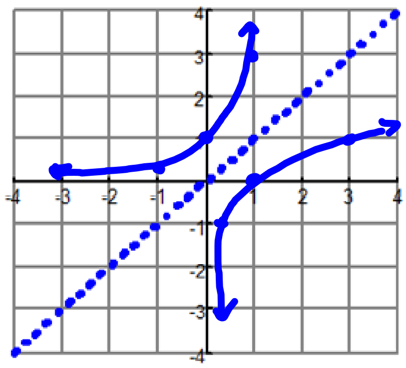
Example 2:

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

$f^{-1}(x) = \log_3 x$

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

x	$f(x) = 3^x$
-1	1/3
0	1
1	3



x	$f^{-1}(x) = \log_3 x$
1/3	-1
1	0
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
-

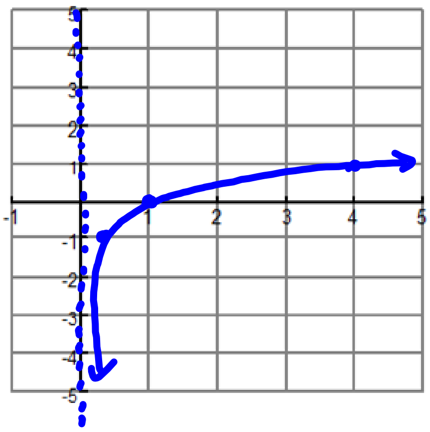
x	y
$\frac{1}{a}$	-1
1	0
a	1

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

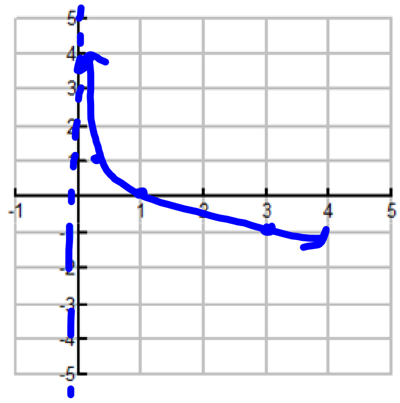
a.) $f(x) = \log_4 x$

$x = 0$

x	y
1/4	-1
1	0
4	1



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



x	y
3	-1
1	0
1/3	1

Transformations of Logs

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

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 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

log x +2

log (x +2)

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

left 2 x= -2

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

up 2 x = 0

c.) $f(x)=-\log_a(x)$

Reflection over x axis x= 0

d.) $f(x)=\log_a(-x)$

Reflection over y-axis x= 0

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

up 4 Right 3

f.) $f(x)=2\log_a(x+5)-11$

Stretch by 2 x= -5

Left 5

down -11

Graph each one of these. Do not guess on intercepts. If you have to solve an equation to find an intercept then do it. Graph the parent function. Then move the 3 points using transformations. State all x and y intercepts.

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

Asymptote $X=-2$

x-intercept $(-1,0)$

y-intercept $(0,.63)$

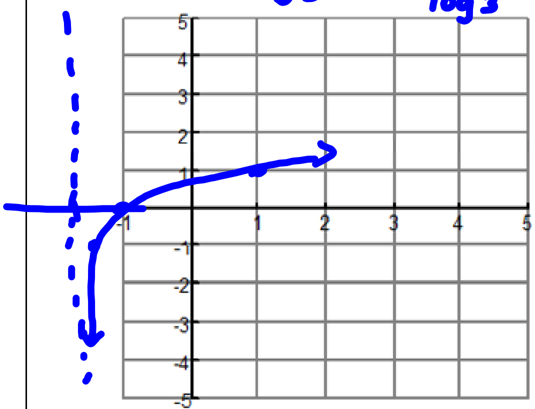
$\log_3 2 = \frac{\log 2}{\log 3}$

$\log_3 x$

x	y
1/3	-1
1	0
3	1

↓

x-2	y
-1.6	-1
-1	0
1	1



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

Asymptote $X=-3$

x-intercept $(-1,0)$

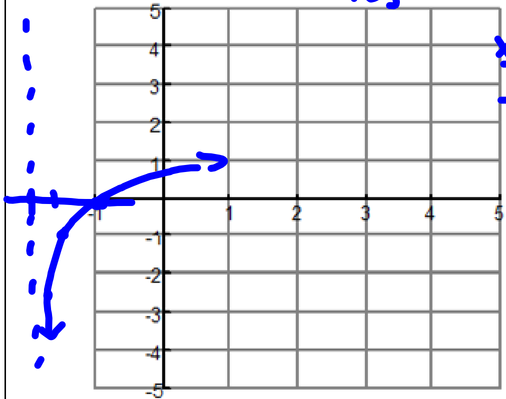
y-intercept $(0,.58)$

$\log_2 3 - 1$ $\frac{\log(3)}{\log(2)} - 1$

$\log_2 x$

x	y
1/2	-1
1	0
2	1

x-3	y-1
-2.5	-2
-2	-1
-1	0



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

Asymptote $x = -2$

x-intercept $(-1, 0)$

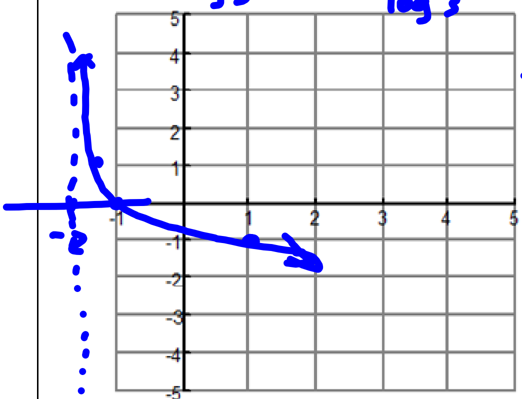
y-intercept $(0, -.63)$

$-\log_3 2 \rightarrow -\frac{\log 2}{\log 3}$

$\log_3 x$

x	y
1/3	-1
1	0
3	1

x-2	-y
-1.6	1
-1	0
1	-1



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

Asymptote $x = 0$

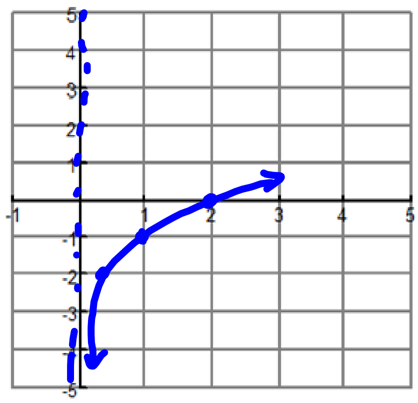
x-intercept $(2, 0)$

y-intercept None

$\log_2 x$

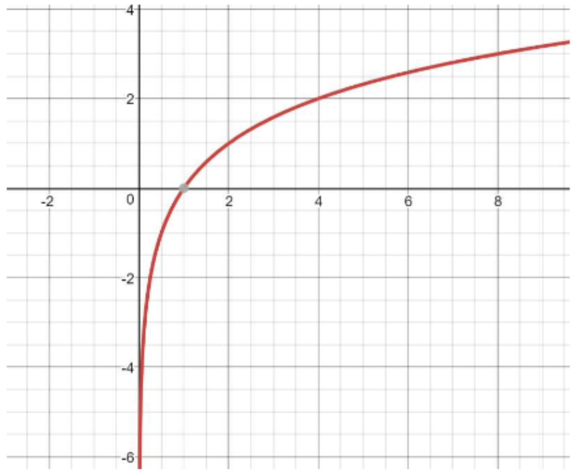
x	y
1/2	-1
1	0
2	1

x	y-1
1/2	-2
1	-1
2	0



Characteristics of Logs

General Shape



Parent Function: $y = alog_b(x+h)+k$

Domain: (h, ∞)

Range: $\mathbb{R}$ **or** $(-\infty, \infty)$

x-intercept: (x, 0)

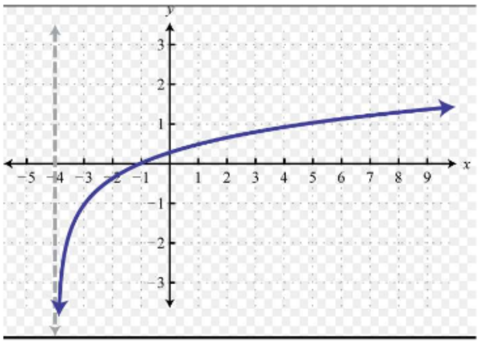
y-intercept: (0, y)

Asymptote: x = h

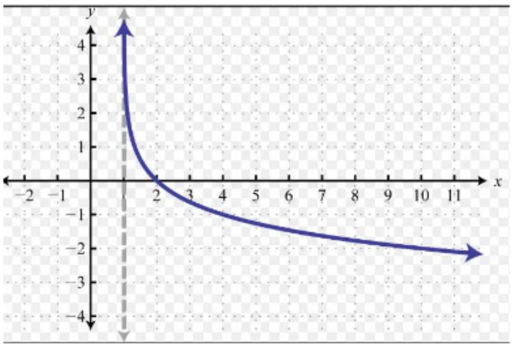
(h, ∞) * Domain

Interval of Increase or Decrease ~~(−∞, ∞)~~

End Behavior:
as $x \to$ h , $f(x) \to$ ______
as $x \to$ ∞/−∞ , $f(x) \to$ ______ } +∞/−∞



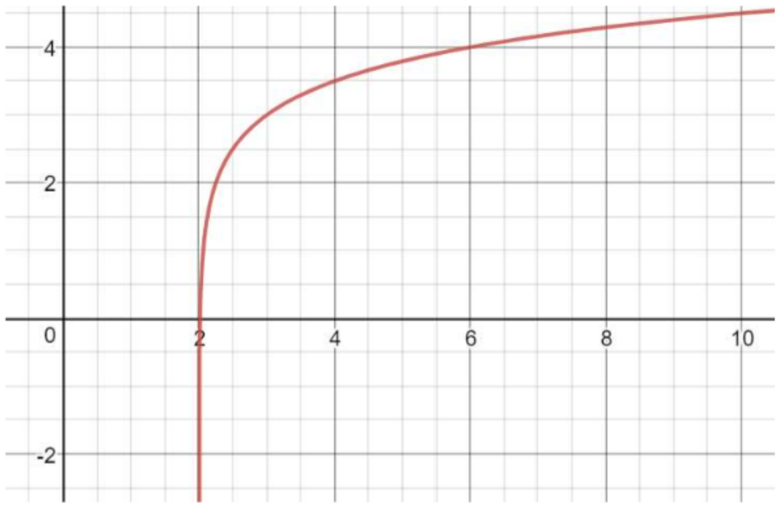
Domain	$(-4, \infty)$ $x > -4$
Range	$(-\infty, \infty)$
Asymptote	$x = -4$
x-int	$(-1, 0)$
y-int	$(0, .26)$
increasing or decreasing: $(-4, \infty)$	
End Behavior	as $x \to -4$, $f(x) \to -\infty$ as $x \to \infty$, $f(x) \to \infty$



Domain	$(1, \infty)$ $x > 1$
Range	$(-\infty, \infty)$
Asymptote	$x = 1$
x-int	$(2, 0)$
y-int	None
increasing or decreasing $(1, \infty)$	
End Behavior	as $x \to 1$, $f(x) \to \infty$ as $x \to \infty$, $f(x) \to -\infty$

Identify the given characteristics for the following graphing.

$$y = log_4(x - 2) + 3$$



Domain	$(2, \infty)$
Range	$(-\infty, \infty)$
Asymptote	$x = 2$
x-int	$(2, 0)$
y-int	None
Increasing or decreasing: $(2, \infty)$	
End Behavior	$as\ x \to$ 2, $f(x) \to -\infty$ $as\ x \to \infty$, $f(x) \to \infty$