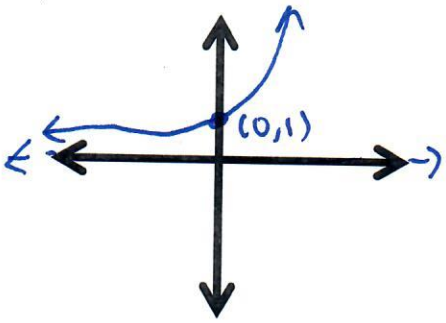
3.5 Exponential and Logarithmic Functions

EQ: How do I graph exponential and logarithmic functions?

Exponential Parent Function $y = b^x$



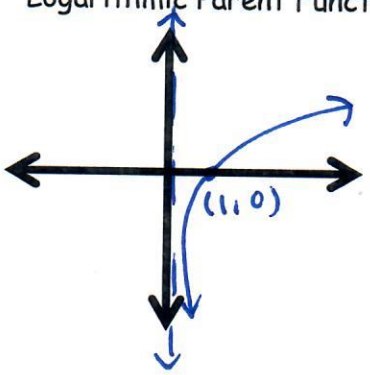
Key Points

(0, 1)

(1, base)

y = 0

Logarithmic Parent Function $y = \log_b x$



Key Points

(1, 0)

(base, 1)

x = 0

Equation		Type of Transformation	Change to key points
$y = b^x + a$	$y = \log_b x + a$	vertical shift	add a to y-coordinate
$y = b^{x+a}$	$y = \log_b(x+a)$	horizontal shift	subtract a from x-coord.
$y = -b^x$	$y = -\ln x$	vertical reflection	make y coord. negative
$y = b^{-x}$	$y = \ln(-x)$	horizontal reflection	make x coord neg.

To find the domain of a logarithmic function:

set argument > 0
(inside)

Ex: Find the domain of $y = \log_3(-2x+6) + 3$

$-2x+6>0$

$\frac{-2x}{-2} > \frac{-6}{-2}$

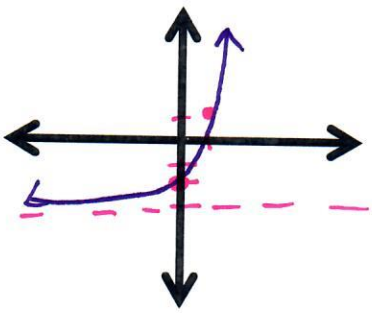
$x<3$

$\boxed{(-\infty, 3)}$

Examples:

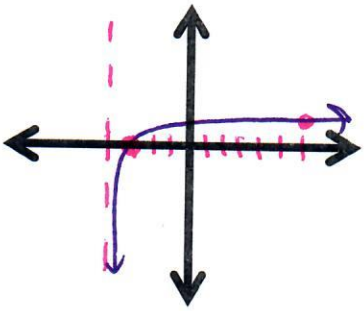
$y = 4^x - 3$ y-3

Original Points:	New Points:
(0,1)	(0,-2)
(1,4)	(1,1)
y = 0	y = -3



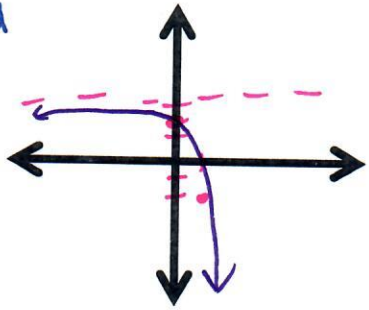
$y = \log(x+4)$ x-4

Original Points:	New Points:
(1,0)	(-3,0)
(10,1)	(6,1)
x=0	x=-4



$y = -5^x + 3$ ② y+3 ① -y coord

Original Points:	New Points:
(0,1)	(0,2)
(1,5)	(1,-2)
y=0	y=3



For $y = b^x$ if $0<b<1$, then your graph is:

reflected horizontally (decay)

ex. $y = \frac{1}{2}^x$