Chapter 7.4: Evaluate Logarithms and Graph Logarithmic Functions.

$$\log_b y = x \Leftrightarrow b^x = y$$

used to solve exponential equations.

Rewrite:

$\log_2 8 = 3$ → $2^3 = 8$

$\log_4 1 = 0$ → $4^0 = 1$

$\log_{12} 12 = 1$ → $12^1 = 12$

$\log_{1/4} 4 = -1$ → $\left(\frac{1}{4}\right)^{-1} = 4$

Properties:

$\log_b 1 = 0$ $b^0 = 1$

$\log_b b = 1$ $b^1 = b$

$\log_b b^x = x$ $b^x = b^x$

$b^{\log_b x} = x$ $\log_b x = \log_b x$

Evaluate:

$\log_4 64$ → $4^x = 64$ $x = 3$

$\log_4 4^3 = x = 3$

$\log_5 0.2$ → $5^x = \frac{1}{5}$ $x = -1$

$\log_{1/5} 125$ $\left(\frac{1}{5}\right)^x = 125$ $x = -3$

$\log_{36} 6$ $36^x = 6$ $x = \frac{1}{2}$

Common Log

base 10

$\log_{10} x = \log x$

Natural Log

base e

$\log_e x = \ln x$

Use Calculator:

$\log 8$

$\log_{10} 8 = x$

$x = .903$

$\ln 0.3$

$\log_e 0.3 = x$

$x = -1.20$

The wind speed(s) near the center of a tornado can be modeled by $s = 93\log d + 65$ where d is the distance that the tornado travels. In 1925, a tornado traveled 220 miles through three states. Estimate the wind speed near the tornado's center.

Simplify:

$10^{\log 4} = x$

$\log_{10} x = \log_{10} 4$

$x = 4$

$\log_5 25^x$

$\log_5 5^{2x}$

$2x$

Find the inverse

$y = 6^x$

$x = 6^y$

$\log_6 x = y$

$y = \ln(x+3)$

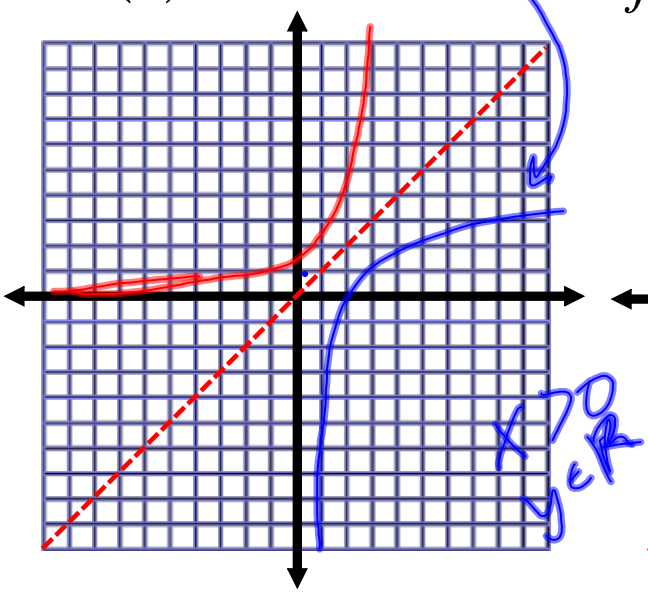
$x = \ln(y+3)$

$e^x = y + 3$

$y = e^x - 3$

Parent Functions: $y = a\log_b(x-h)+k$

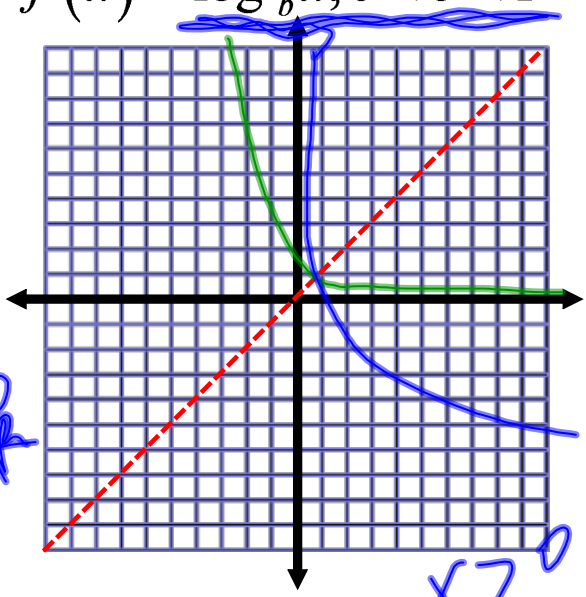
$f(x) = \log_b x, b > 1$



$x > 0$

$y \in \mathbb{R}$

$f(x) = \log_b x, 0 < b < 1$



$x > 0$

$y \in \mathbb{R}$

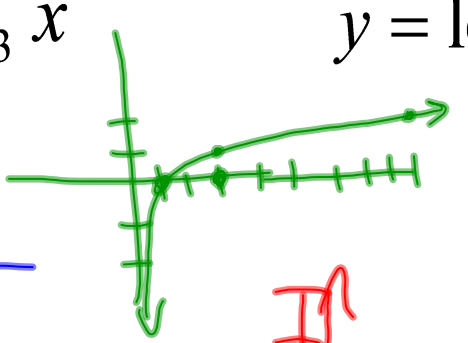
Graph:

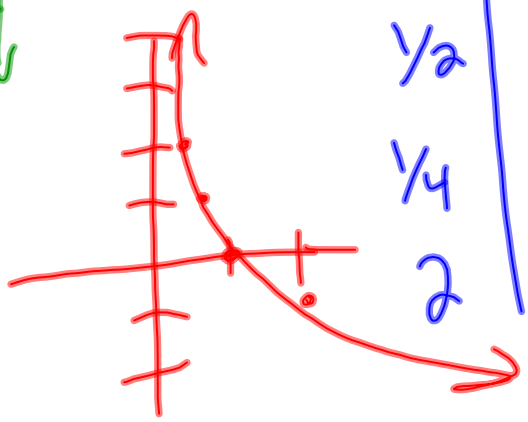
$y = \log_3 x$

x	y
3	1
9	2
1	0
1	

$y = \log_{1/2} x$

x	y
1	0
1/2	1
1/4	2
2	-1





Graph, give Domain/Range, from PF.

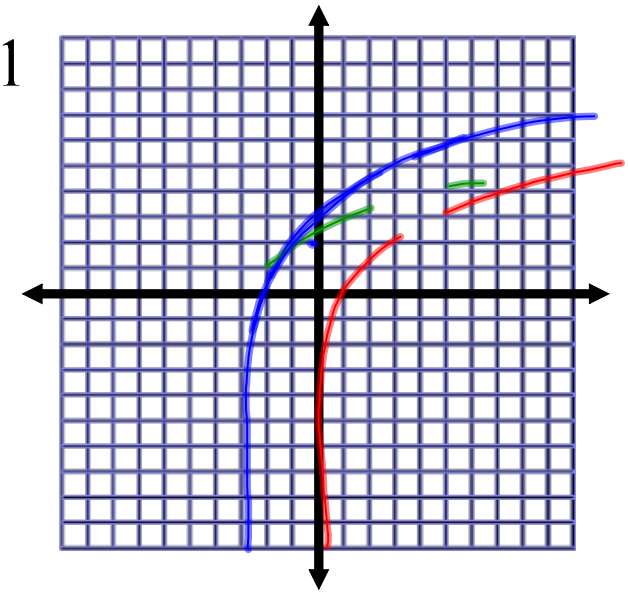
$f(x) = \log_3(x+3)+1$

$x > -3$

$y \in \mathbb{R}$

left 3

up 1



Homework: Chapter 7.4
pg.503 #'s 5,9,15,17,21,
27,31,35,39,43,47,51,59