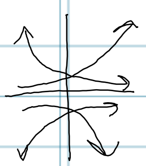
Prof. Kincade

March 19

Exponents and Logs



H.A.	V.A.
(0,1)	(1, 0)
(0,-1)	(-1, 0)
D: ℝ	D = (0, ∞)
R: (0, ∞).	R: ℝ

Section 6.4 — Logarithms

→ Logs and exponentials are inverse functions.

$\log_b x$ b^x { The answer to a logarithm is an exponent

→ $\log_2 8$ ⇒ "What exponent do I put on the base '2' to get the number 8?"

$\log_2 8 = x$; $\boxed{x = 3}$ $\boxed{2^3 = 8}$

$\log_3 81 = x$; $\boxed{x = 4}$ $\boxed{3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81}$

☆ $\log_4 2 = x$; $\boxed{x = 1/2}$ { $\sqrt{x} = x^{1/2}$

$4^{1/2} = 2$

$\boxed{\sqrt{4} = 2}$

$\log_{81} 3 = x$; $\boxed{x = 1/4}$ { $\sqrt[4]{x}$

$\boxed{\sqrt[4]{81} = 3}$

Definition of a Logarithm, pg. 438

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

You can change from logs to exponents as you see fit!

So long as it fits the formula!!

Logs in a calculator

$\log_{10} x \Rightarrow \boxed{\log x}$ or $\boxed{\log}$, common log

$\log_e x \Rightarrow \boxed{\ln x}$, natural log

Change of base formula

$$\log_b a = \frac{\log_c a}{\log_c b}$$

; "c" is an arbitrary number that you choose; We usually use e, for $\ln a$, or 10, for $\log a$.

$\rightarrow \log_2 8 = \frac{\log 8}{\log 2} = \boxed{3}$

$\rightarrow \log_2 8 = \frac{\ln 8}{\ln 2}$ ← cool Arcade stories

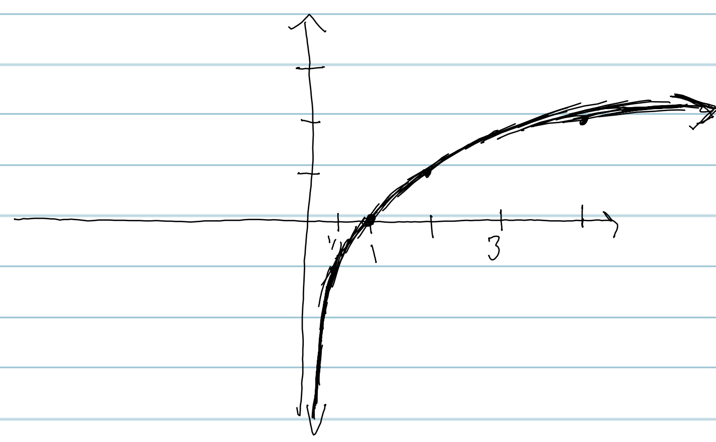
→ ☆ — — All about Prof's college! And back on topic! :) ☆

Graphing Logs

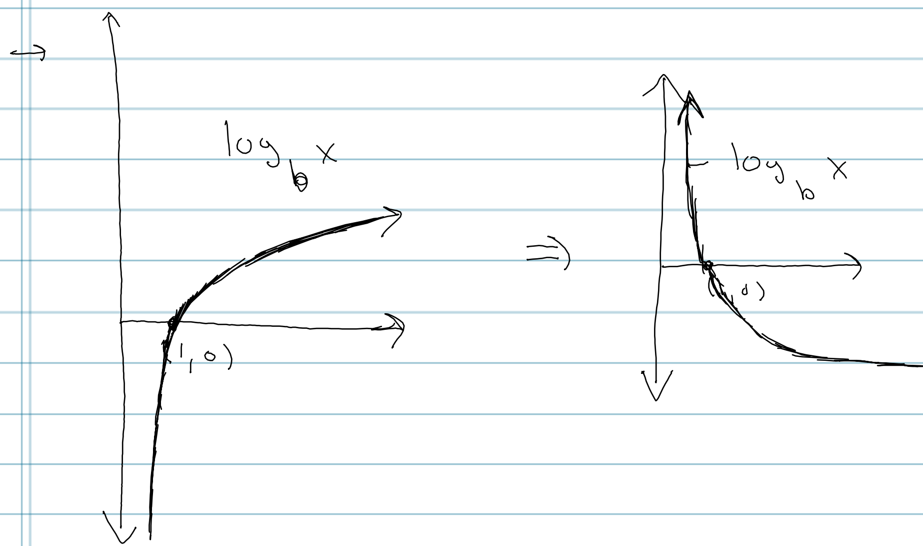
$y = \log_2 x$ ← Find the pattern, go through the motions.

☆ Domain of logs is ~~...~~ $\boxed{x > 0}$!

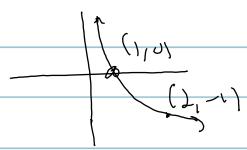
x☆	y
$\frac{1}{2}$	$\log_2 \frac{1}{2} = -1 \Rightarrow 2^{-1} = \frac{1}{2}$!
1	$\log_2 1 = 0$
2	$\log_2 2 = 1$
4	$\log_2 4 = 2$
8	$\log_2 8 = 3$



let's try $\boxed{y = -\log_2(x)}$



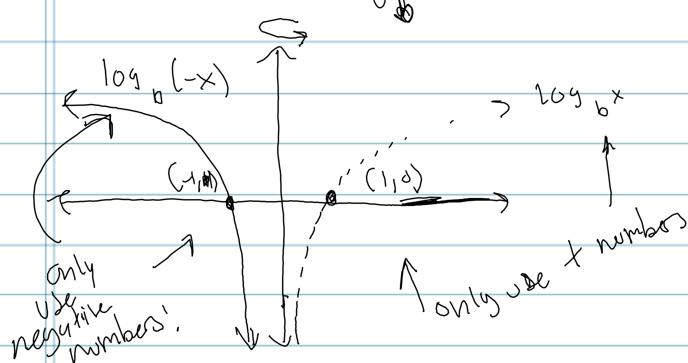
So: $-\log_2(x) \Rightarrow$

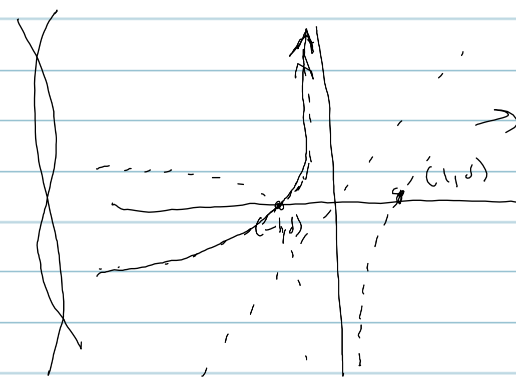


x	y
$\frac{1}{2}$	$-\log_2(\frac{1}{2}) = -(-1) = \boxed{1}$
1	$-\log_2(1) = \boxed{0}$
2	$-\log_2(2) = -(1) = \boxed{-1}$

→ How about $\log_b(-x)$?

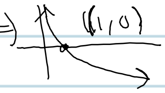
→ And $-\log_b(-x)$? → { Flip x AND y



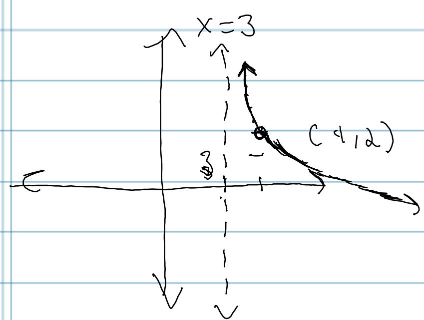


Graph $y = -\log_5 (x-3) + 2$

☆ "–" on the log means flip about the y-axis, so:

$-\log_b x \Rightarrow$ 

→ SO: Start = (1, 0)
Shift = (3, 2) → vertical asymptote
New start = (4, 2)
V.A. ⇒ x = 3



☆ $-\log_5 (x-3) + 2 = 0$
$-\log_5 (x-3) = -2$
$\log_5 (x-3) = 2$
$5^2 = x-3$
$25 = x-3 \Rightarrow \boxed{x = 28}$

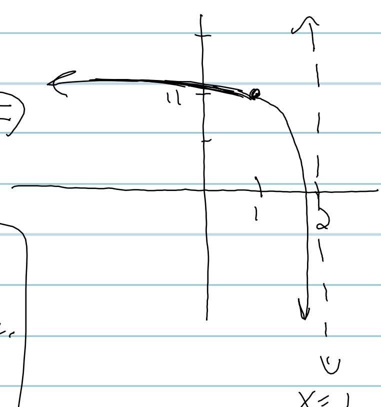
Prof. kinda got this too. But what was my process?

What did I just do? Ask me!

$y = \ln (2 - \cancel{x}) + 4$

→ $+ \ln(-x)$ ⇒ 

Start: (-1, 0)
Shift: (2, 4)
New start: (1, 4)
V.A. ⇒ x = 2

⇒ 

Domain: $(-\infty, 2)$
Range: $(-\infty, \infty)$

→ Stretches will affect your y-coordinate's value. "0" is not affected by x, so it still 0's!