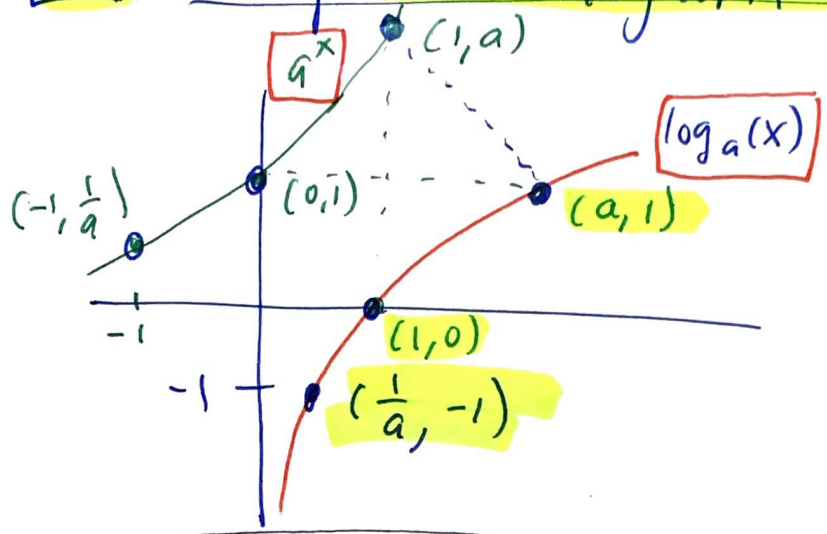


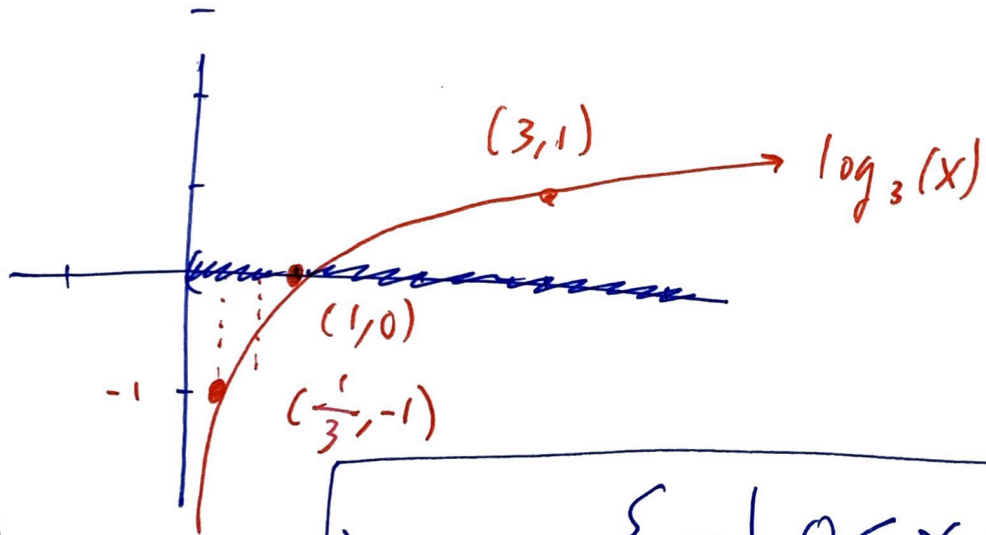
4.4 Graphs of logarithms

①



* Famous Points for $y = \log_a(x)$

Ex graph $f(x) = \log_3(x)$



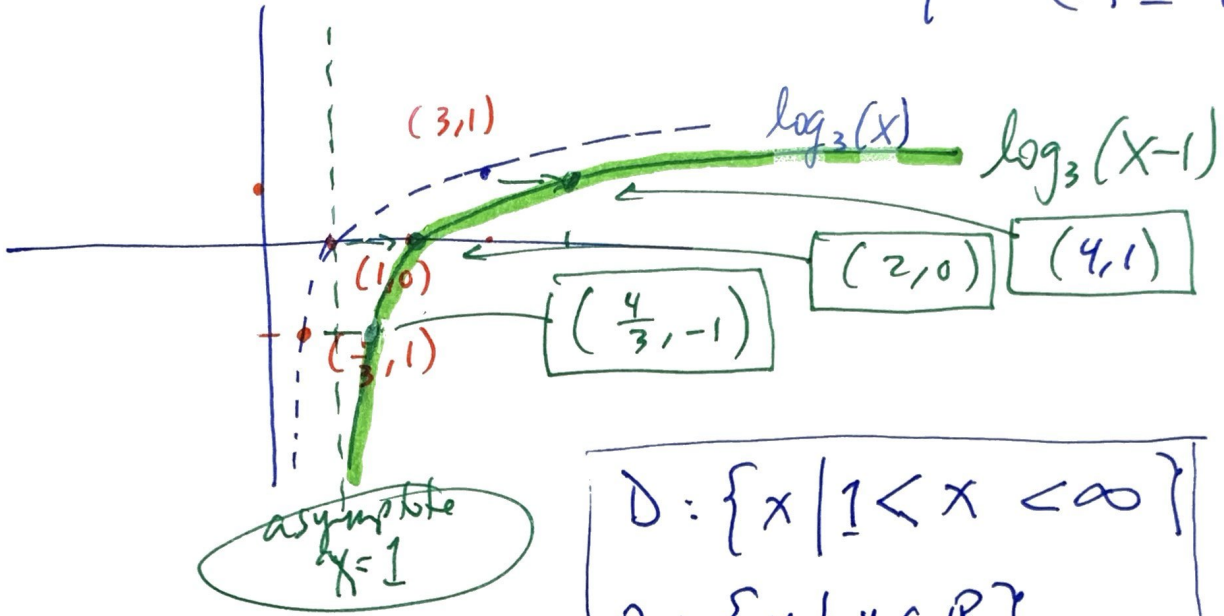
$$D_{\log_3(x)} : \{x \mid 0 < x < \infty\}$$

$$R_{\log_3(x)} : \{y \mid y \in \mathbb{R}\}$$

asymptote : $x=0$ line

Ex Sketch $g(x) = \log_3(x-1)$: List the 3 points of asymptote (2)

$y = \log_3(x-1)$ ohh.. $\left\{ \begin{array}{l} \log_3(x) \text{ shifted} \\ (+1 \text{ unit.}) \end{array} \right.$



$$D: \{x \mid 1 < x < \infty\}$$

$$R: \{y \mid y \in \mathbb{R}\}$$

⊗ Domain w/o graph ...

The arguments of any basic logarithm is such that it is always pos and non-zero.

Ex what is the domain: $f(x) = \log_2(12-3x) - 3$

we need $12-3x > 0$ so solve this for x :

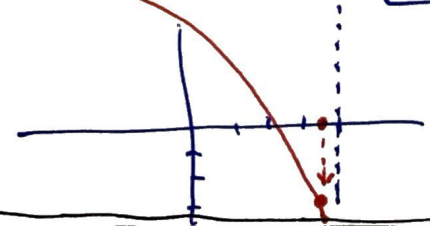
$$-3x > -12 \quad \rightarrow \div -3$$

$$x < \frac{-12}{-3}$$

$$x < 4$$

$$D: \{x \mid x < 4\}$$

BTW:



when $\log_2(1) = 0$ so $\frac{12-3x}{-3} = 1$

$$-3x = -11$$

$$x = 11/3$$

EX Sketch

$$f(x) = \log_2(12-3x) - 3$$

3

• root : $0 = \log_2(12-3x) - 3$

$$3 = \log_2(12-3x)$$

$$2^3 = 12-3x$$

$$8 = 12-3x$$

$$3x = 12-8$$

$$\boxed{x = 4/3}$$

• asymptote : $\boxed{x = 4}$

• y-int : $x=0 \Rightarrow f(0) = \log_2(12-3 \cdot 0) - 3$

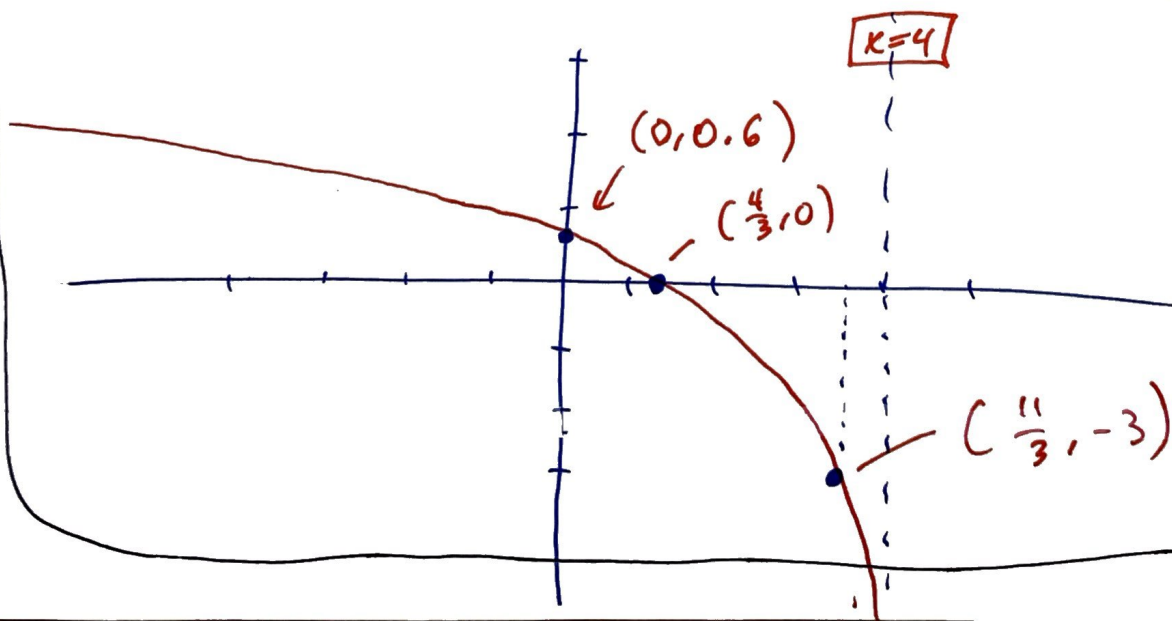
$$\Rightarrow y_{\text{int}} = \log_2(12) - 3$$

$$= 3.585 - 3$$

$$= 0.59 \approx \boxed{0.6}$$

• @ $x = 11/3$ $\log_2(1) - 3 = -3$

$$\boxed{\left(\frac{11}{3}, -3\right)}$$



* Solving Equations w/ equiv. problem

4

EX Solve for x :

$$\underbrace{\log(2x-3) + 2}_{f(x)} = \underbrace{-\log(2x-3) + 5}_{g(x)}$$

Desmos: $(\underline{17.31139}, 3.5)$

analytical soln:

$$\underbrace{+\log(2x-3) + \log(2x-3)} = 5-2$$

$$2 \log(2x-3) = 3$$

$$\log(2x-3) = 3/2$$

Eq Prob

$$10^{3/2} = 2x-3$$

$$10^{3/2} + 3 = 2x$$

$$\frac{10^{3/2} + 3}{2} = x$$

$$x = \frac{10^{1.5} + 3}{2}$$

1.5 2nd 10^x

$$x = \frac{31.62 + 3}{2}$$

$$\boxed{x \approx 17.31}$$

EX Solve for x

ln(x-2) = +ln(x+1)

~~x-2 = x+1~~

math speak for "contradiction"

-2 = 1

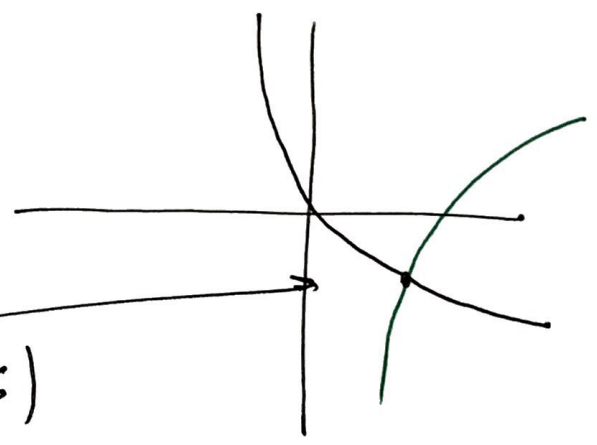
* So No Solution

These graph do not intersect!

EX Solve graphically (numerical answer)

ln(x-2) = -ln(x+1)

Desmos:



(2.30278, -1.19476)

ans: X = 2.303