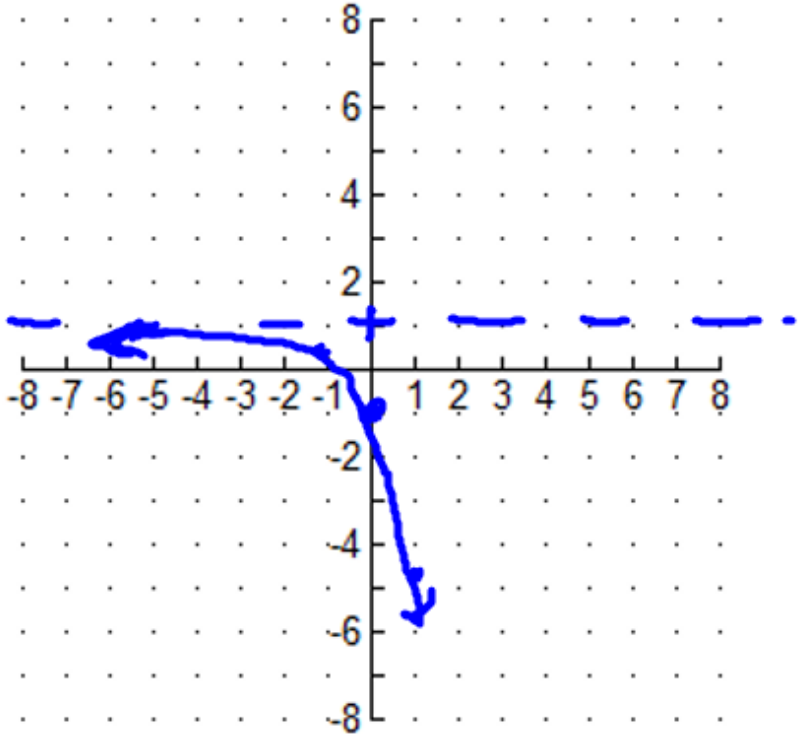
2nd LN

1) Graph $y = 1 - 2e^{x}$ -1



x	y
-3	
-2	
-1	
0	
1	
2	

key e^x

$(-1, \frac{1}{e}) \approx (-1, .4)$

$(0, 1) \to (0, 1)$

$(1, e) \approx 1, 2.7$

$(-1, -.8)$

$(0, -2)$

$(1, -5.4)$

Lesson 5.2: Logarithms

Logarithm (Definition):

$$y = b^x \quad \Leftrightarrow \quad \log_b(y) = x$$

$$Note\text{:}\ b > 0\ and\ b \neq 1$$

log base b of y equals x.

Ask: b to what power (x) equals y?

Common Log

$$\log_{10}(x) = \boxed{\log(x)}$$

Natural Log

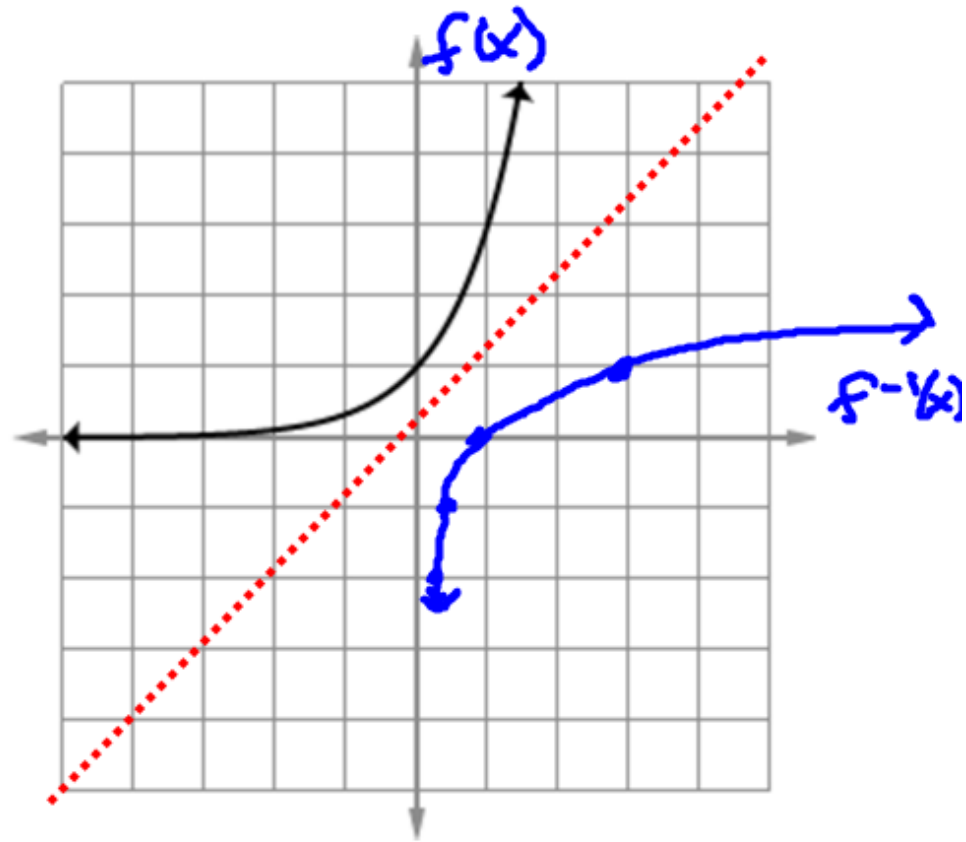
$$\log_e(x) = \ln(x)$$

$f(x) = 3^x$

x	y
-2	1/9
-1	1/3
0	1
1	3
2	9

$f^{-1}(x)$

x	y
1/9	-2
1/3	-1
1	0
3	1
9	2



Evaluate

$\log_4 16 = \boxed{2}$

A: $4^{\square} = 16$

$\boxed{2}$

$\log_3 \frac{1}{81} = \boxed{-4}$

Ask: $3^{?} = \frac{1}{81}$

$\log_5 125 = \boxed{3}$

Ask: $5^{?} = 125$

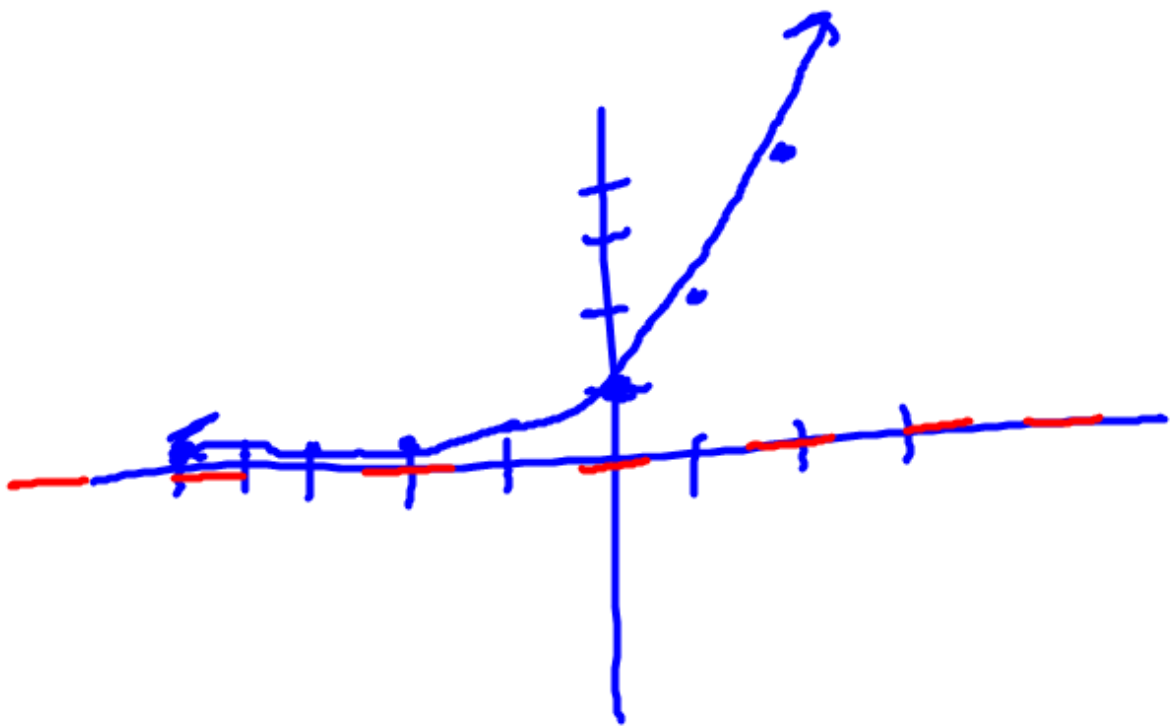
$\log_7 \frac{1}{49} = \boxed{-2}$

Ask: $7^{?} = \frac{1}{49}$

$\log_2(-32) = \cancel{-5}$ NS.

Ask: $2^{?} = -32$

$2^{5} = 32 \quad 2^{-5} = \frac{1}{32}$



$y = 2^x$

$\log_3 1 = 0$

$3^{?} = 1$

$\log_3 3 = 1$

$\log_7 1 = 0$

$7^{?} = 1$

$\log_7 7 = 1$

Change of Base Formula

Log Properties

1) $\log_b 1 = 0$

2) $\log_b b = 1$

3) $\log_b b^n = n$

4) $\log_b a = \frac{\log_d(a)}{\log_d(b)}$

$\log(89) \div \log(7)$

$\log_{16} 7 = \frac{\ln(7)}{\ln(16)} \approx 0.7$

ASK: $16^{?} = 7$

$\log_9 89 = \frac{\log(89)}{\log(9)} \approx 2.04$

$\log_3 59 = \frac{\ln(59)}{\ln(3)} \approx 3.7$

Exponent

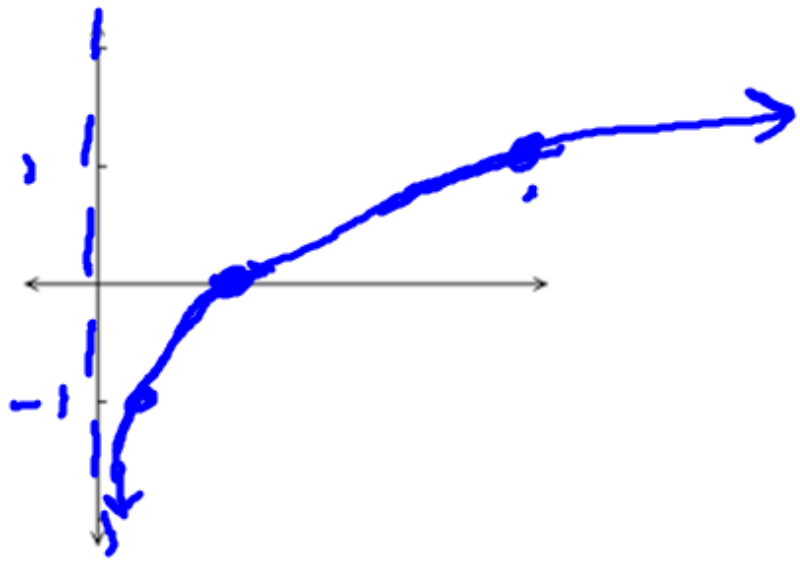
$y = 3^x$

$(-1, \frac{1}{b}), (0, 1), (1, b)$

$y = 0$

Logarithm

$$f(x) = \log_b x, \quad b > 0 \ \& \ b \neq 1$$

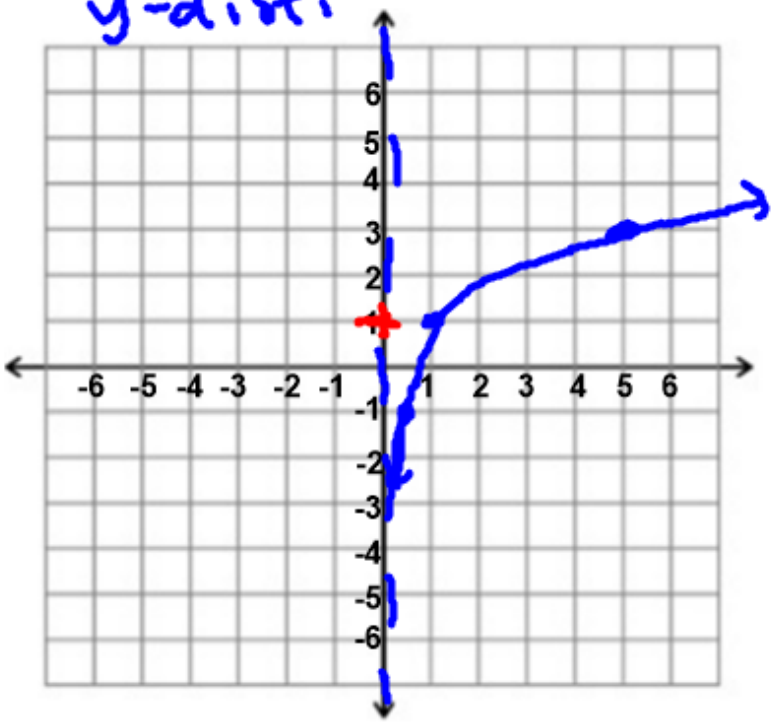


Key Points: $(\frac{1}{b}, -1)$, $(1, 0)$, $(b, 1)$

Asymptote: $x = 0$

$y = 2\log_5(x) + 1$

y-dist.



VA: $x=0$

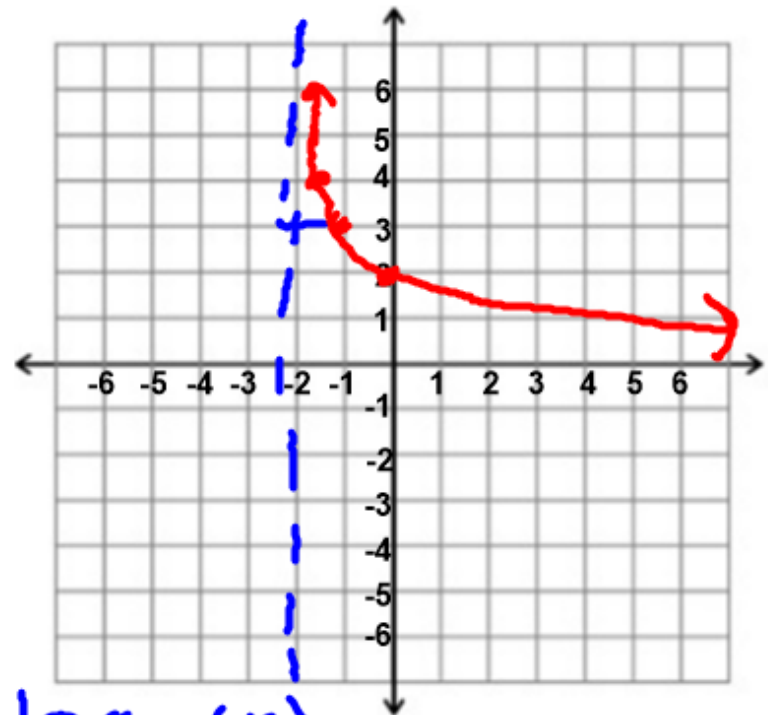
Key:

$(\frac{1}{5}, -1) \rightarrow \frac{1}{5}, -2$

$(1, 0) \rightarrow 1, 0$

$(5, 1) \rightarrow 5, 2$

$y = -\log_2(x + 2) + 3$



$\log_2(x)$

Key

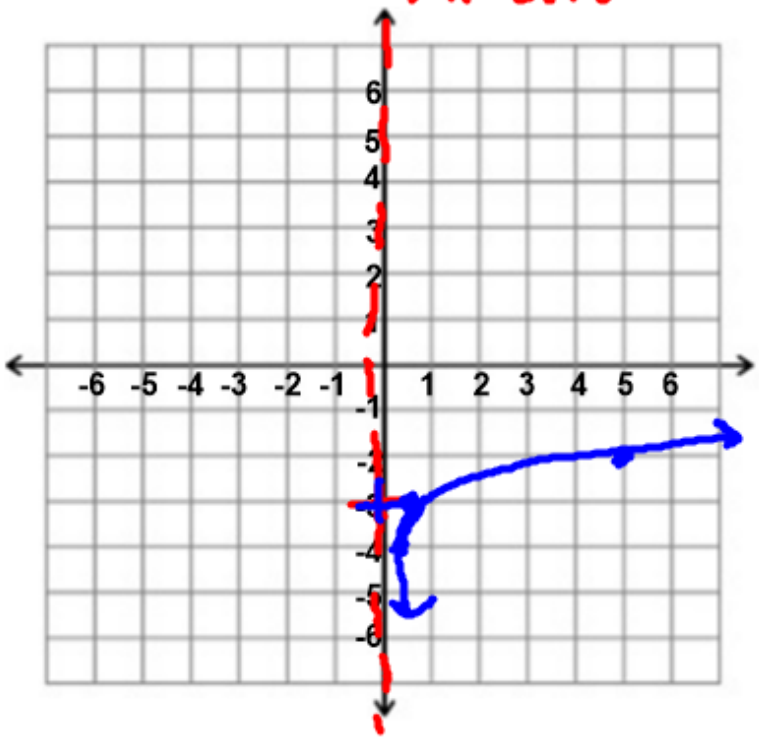
$(\frac{1}{2}, +1)$

$(1, 0)$

$(2, -1)$

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

↳ x-dist.



VA: $x=0$

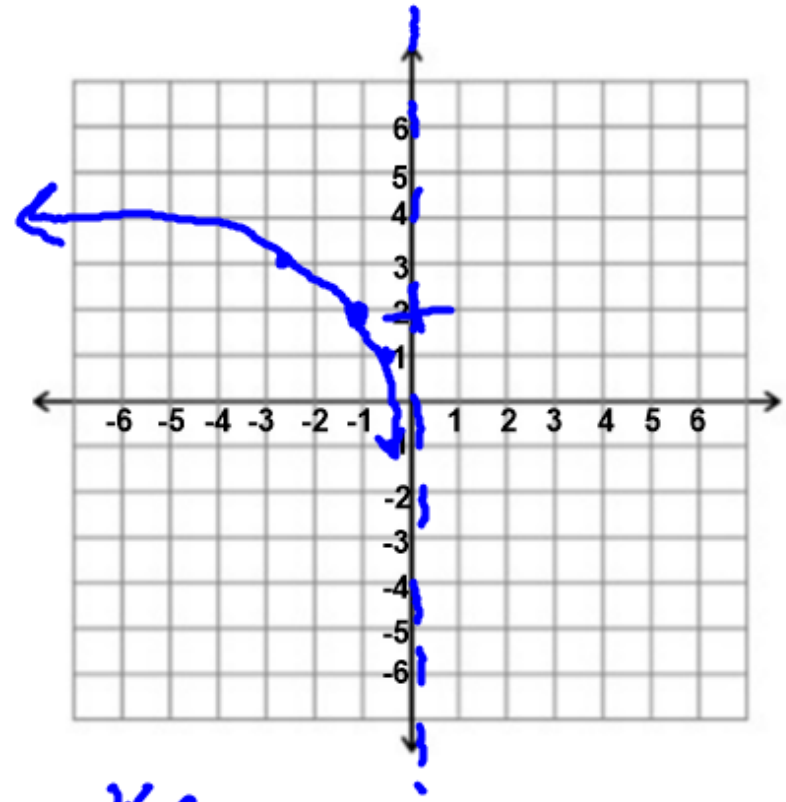
Key

$(\frac{1}{10}, -1) \rightarrow (\frac{1}{20}, -1)$

$(1, 0) \rightarrow (1/2, 0)$

$(10, 1) \rightarrow (5, 1)$

$y = \ln(-x) + 2$



Key

$(\frac{1}{e}, -1) \approx -(0.4, -1)$

$(1, 0) \rightarrow (-1, 0)$

$(e, 1) \approx -(2.7, 1)$