LOGARITHMIC FUNCTIONS

Goal:

- to understand the characteristics of logarithmic functions

- to understand how the parameters affect the graph of a logarithmic function

The basic exponential function is

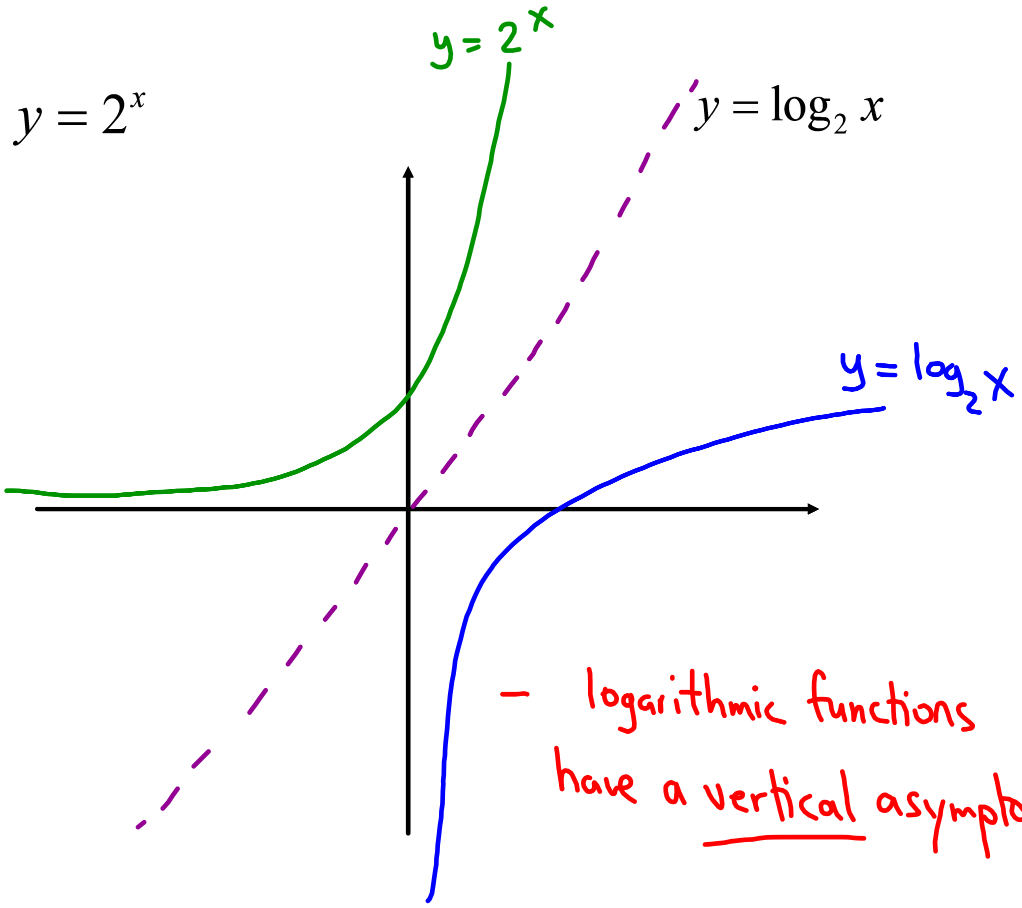
$$y = c^x$$

the inverse of this function is a logarithmic function

$x = c^y$ switch x and y

$y = \log_c x$ rewrite in logarithmic form

$\boxed{f(x) = \log_c x}$ Basic log function



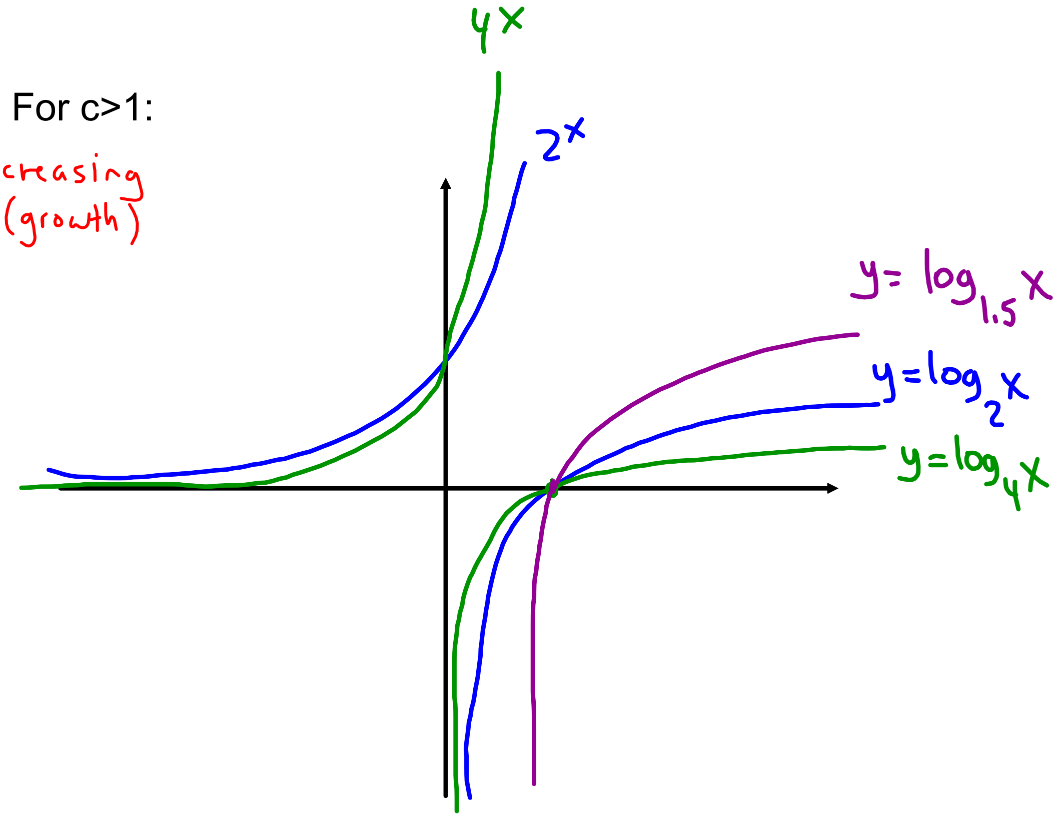
- logarithmic functions have a <u>vertical</u> asymptote

- logarithmic functions have a restricted domain

Logarithmic functions has the exact same restrictions on c as exponential functions.

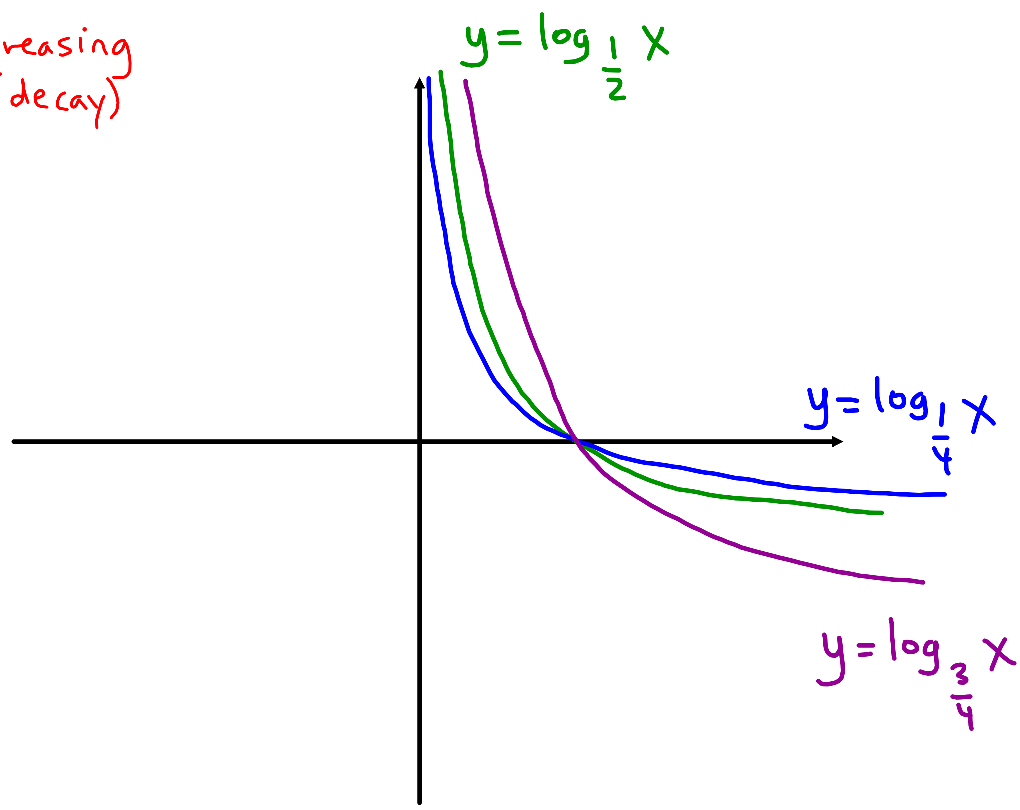
For c>1:

increasing
(growth)



For 0<c<1:

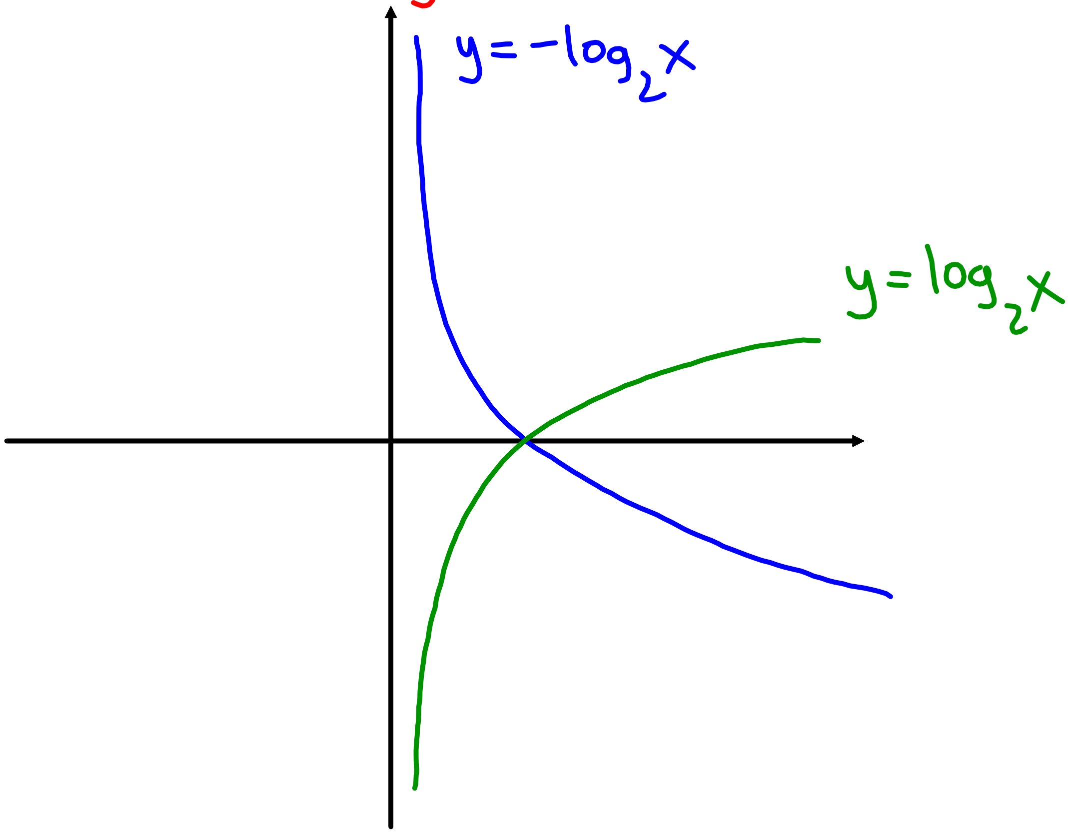
decreasing
(decay)



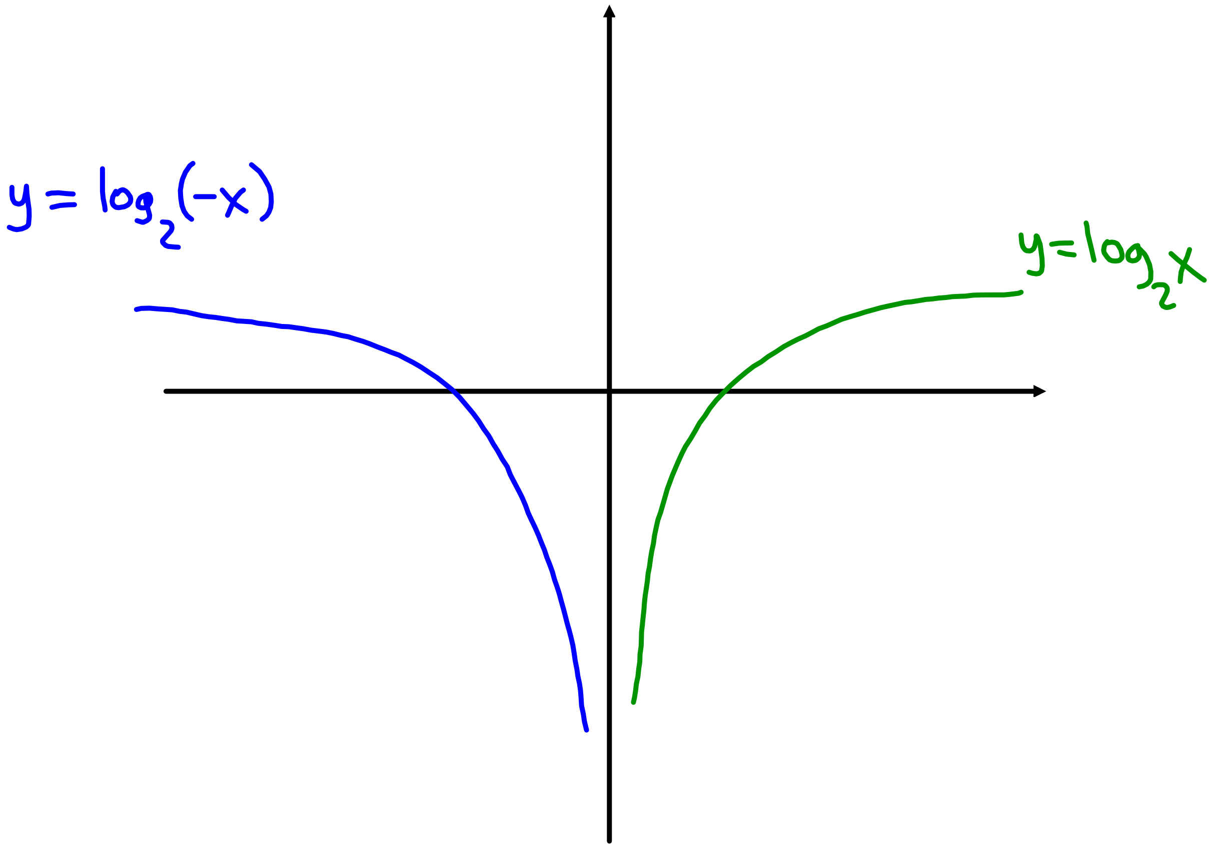
Any transformed logarithmic function can be represented in the form:

$$f(x) = a\log_c[b(x-h)] + k$$

Parameter a: - causes vertical scale change
- if negative causes vertical reflection

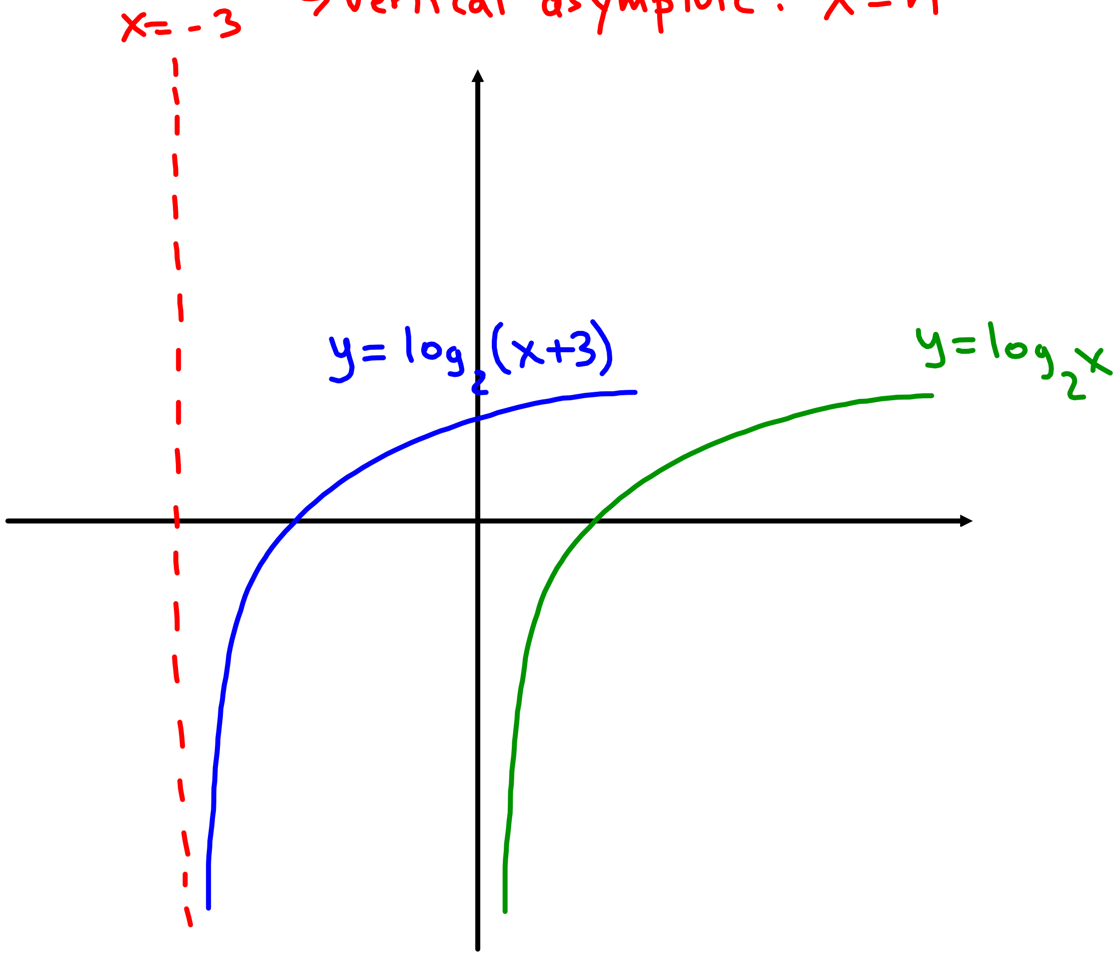


Parameter b: - causes horizontal scale change
- if negative, causes horizontal reflection

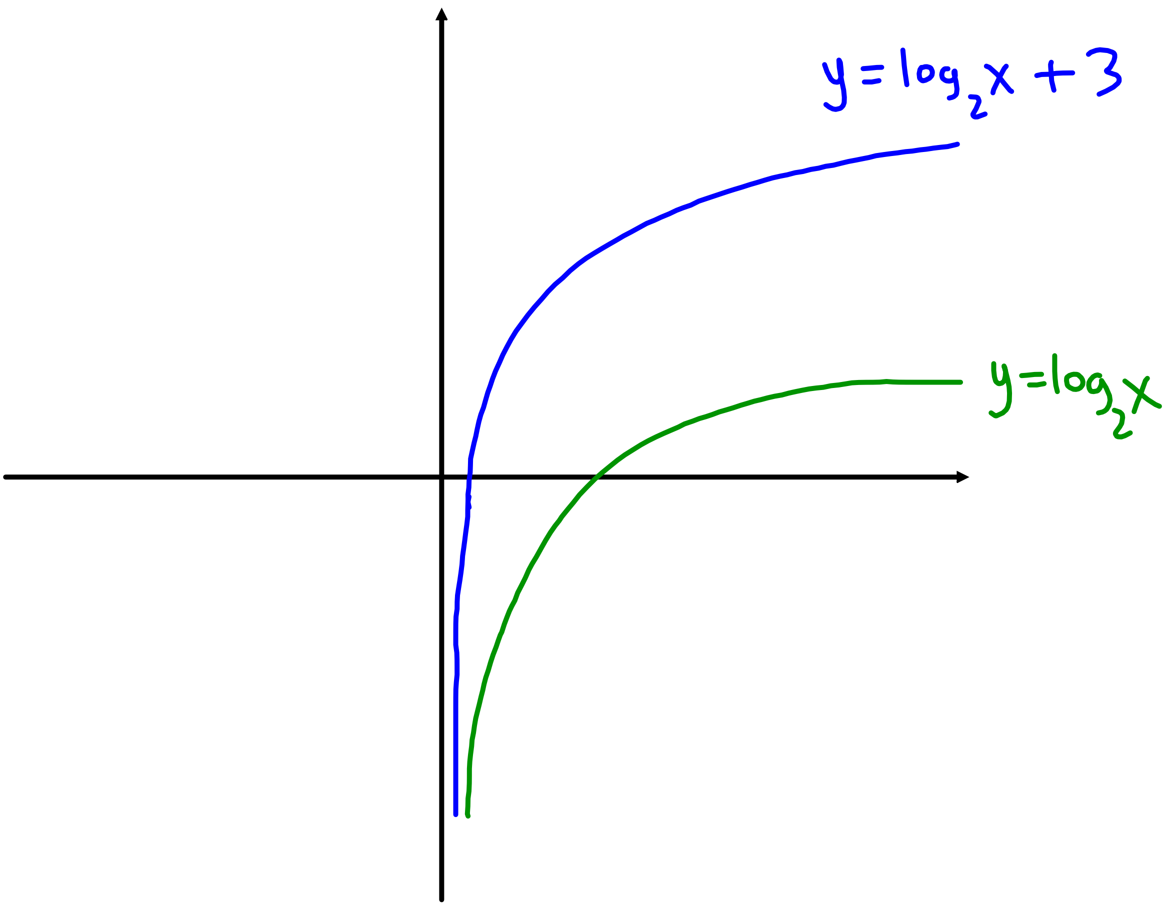


Parameter h: - causes horizontal translation

↳ vertical asymptote : $x = h$



Parameter k: - causes vertical translation



Sketch the function:

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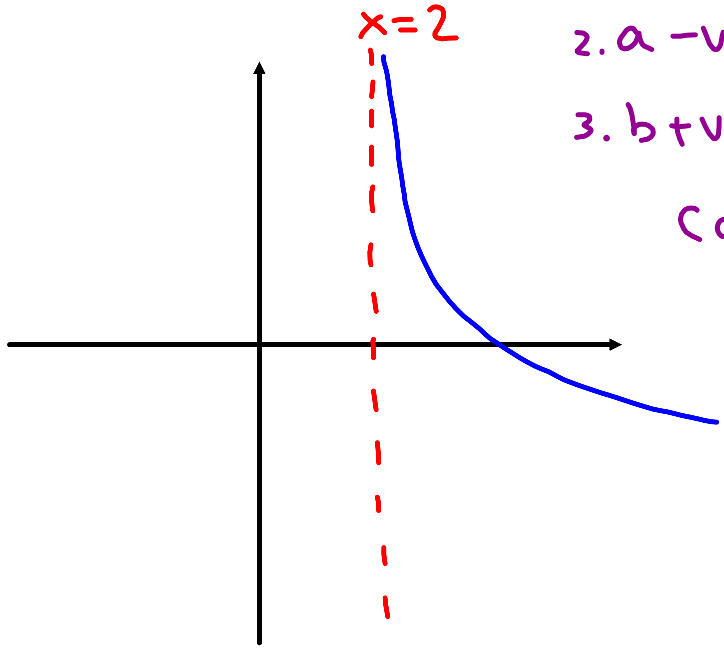
a) $y=-\log_3(2x-4)+1$

$y=-\log_3[2(x-2)]+1$

1. c=3 : increasing
2. a -ve : decreasing
3. b +ve : no reflection

cab

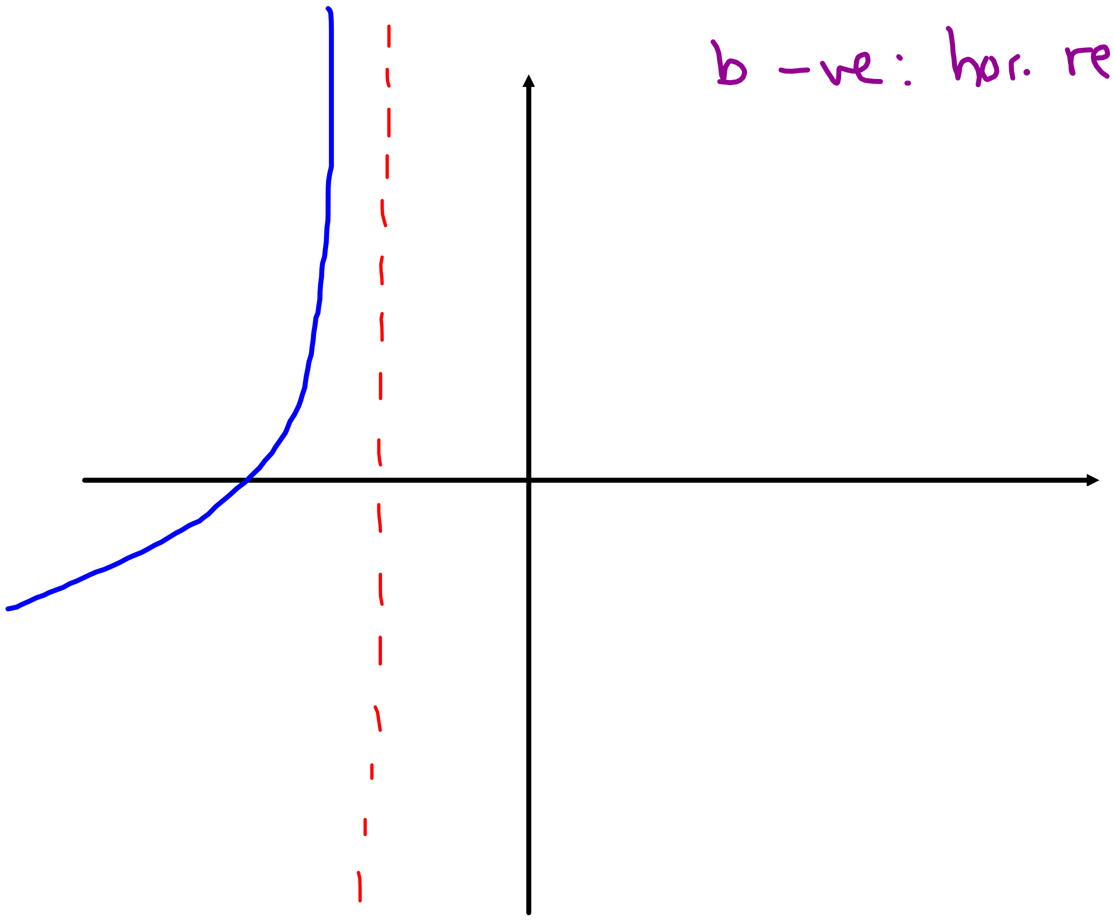


b) $y = 3\log_{\frac{1}{2}}\left[-(x+1)\right] - 2$

$c = \frac{1}{2}$ dec.

a +ve no reflection

b -ve: hor. reflection



$x = -1$