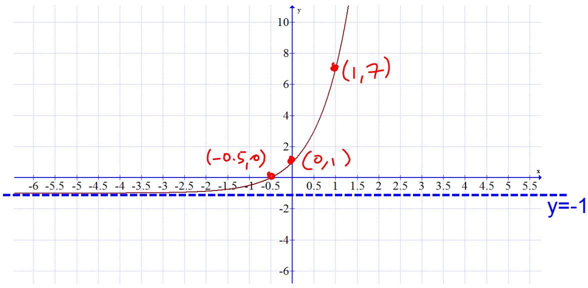
FINDING THE RULE FOR EXPONENTIAL FUNCTIONS

Goal:

- to find the rule for an exponential function in the form $y=ac^x+k$

Given the graph:



1. Identify horizontal asymptote.

ex: $k=-1$

$y = ac^x - 1$

2. Identify ordered pairs (y-int if possible), and substitute into rule.

allows you to find parameter "a" immediately

ex: $1 = ac^0 - 1$

$1 = a - 1$

$2 = a$

In general for $y = ac^x + k$:

(0, y-int) $\quad$ y-int $= ac^0 + k$

y-int $= a + k$

$y = 2c^x - 1$

$0 = 2c^{-0.5} - 1$

$1 = 2c^{-0.5}$

$\frac{1}{2} = c^{-0.5}$

$\frac{1}{2} = \frac{1}{c^{0.5}}$

$\frac{1}{2} = \frac{1}{\sqrt{c}}$

$\sqrt{c} = 2$

$c = 4$

remember $m^{-n} = \frac{1}{m^n}$

and

$m^{\frac{1}{n}} = \sqrt[n]{m}$

$c^{\frac{1}{2}} = \sqrt{c}$

$c^{\frac{1}{3}} = \sqrt[3]{c}$

$y = 2(4)^x - 1$

$\cancel{= 8^x - 1}$

Given two points and the asymptote:

Exponential function passes through points (1,8) and (3,17) and has an asymptote at y=5.

1. $y = ac^x + 5$

2. $8 = ac^1 + 5$ ① $\Rightarrow$ $3 = ac$

$17 = ac^3 + 5$ ② $\Rightarrow$ $12 = ac^3$

② ÷ ①

$4 = c^2$

$c = \pm 2$

$c = +2 \leftarrow$ must be positive

$y = a(2)^x + 5$

$8 = a(2)^1 + 5$

$3 = 2a$

$\frac{3}{2} = a$

$y = \frac{3}{2}(2)^x + 5$