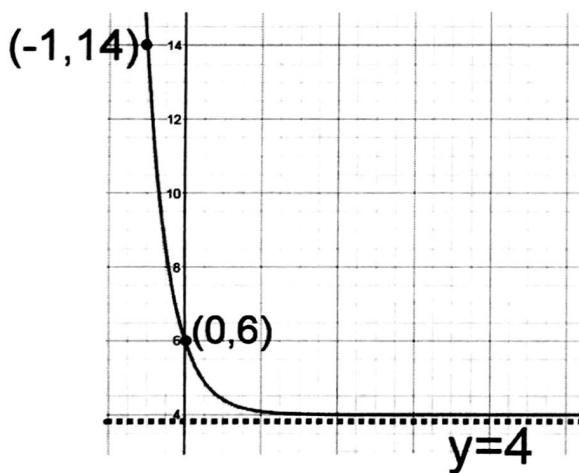


Finding the rule of an exponential function
given the y-intercept, k and a point.

Determine the equation of the following exponential function in the form $y=ac^x+k$.



* When the y-intercept is given as well as the horizontal asymptote use,

$y\text{-int} = a + k$ to find parameter a.

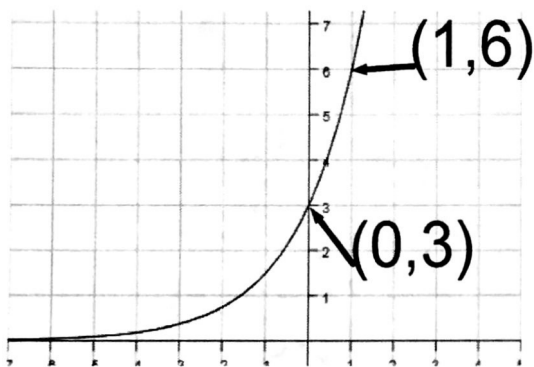
$$\begin{aligned} \text{①} \quad & 6 = a + 4 \\ & a = 2 \end{aligned}$$

$$\begin{aligned} \text{②} \quad & y = ac^x + k \\ & y = 2c^x + 4 \\ & 14 = 2c^{-1} + 4 \\ & 10 = \frac{2}{c} \\ & c = \frac{2}{10} = \frac{1}{5} \\ \therefore & y = 2\left(\frac{1}{5}\right)^x + 4 \end{aligned}$$

Finding the Rule of an Exponential Function given the horizontal asymptote and 2 points

- Always use the form $y=ac^x+k$

Example 1:



The horizontal asymptote is the x-axis, so $k=0$.

Now solve. You can use $y=ac^x$.

$$y = ac^x + k \quad (k=0)$$

$$y = ac^x$$

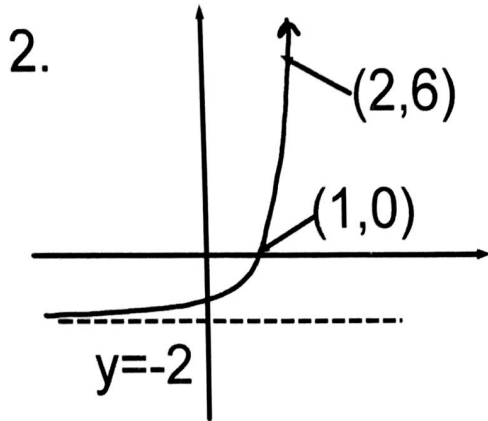
$$\begin{cases} 3 = a(c^0) \rightarrow 1 \\ 6 = ac^1 \end{cases}$$

$$\begin{cases} 6 = ac^1 \end{cases}$$

$$\begin{cases} a = 3 \\ 6 = (3)c \end{cases}$$

$$\begin{cases} a = 3 \\ c = 2 \end{cases}$$

$$\therefore y = 3(2)^x$$



$$y = ac^x + k$$

$$y = ac^x - 2$$

$$\begin{cases} 0 = ac^1 - 2 \\ 6 = ac^2 - 2 \end{cases}$$

$$\begin{cases} 2 = ac \\ 8 = ac^2 \\ a = \frac{2}{c} \\ a = \frac{8}{c^2} \end{cases}$$

$$\frac{2}{c} = \frac{8}{c^2}$$

$$2c^2 = 8c$$

$$2c^2 - 8c = 0$$

$$2c(c-4) = 0$$

$$2c = 0$$

$$c \neq 0$$

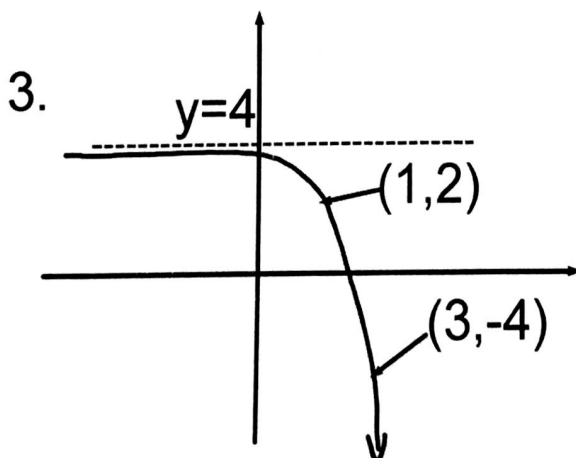
$$c > 0$$

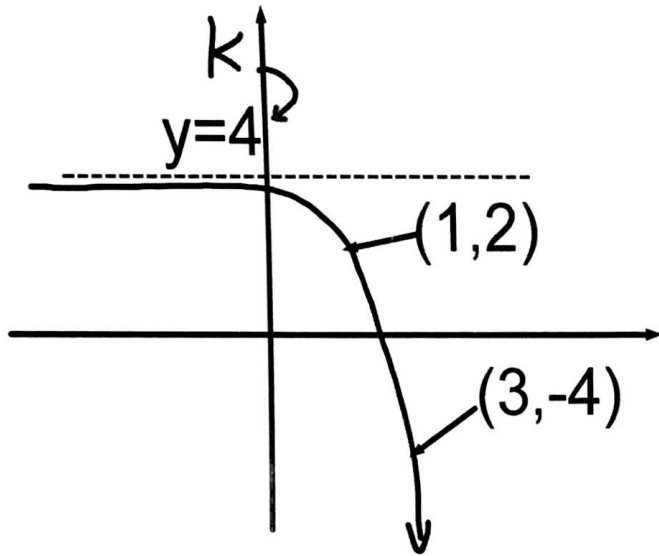
$$c - 4 = 0$$

$$c = 4$$

$$a = \frac{2}{c} = \frac{2}{4} = \frac{1}{2}$$

$$\therefore y = \frac{1}{2}(4)^x - 2$$





Remember: $y = ac^x + k$
 $y = ac^x + 4$

$$\begin{cases} 2 = ac^1 + 4 \\ -4 = ac^3 + 4 \end{cases}$$

$$\begin{cases} -2 = ac \\ -8 = ac^3 \end{cases}$$

$$\begin{cases} a = \frac{-2}{c} \\ a = \frac{-8}{c^3} \end{cases}$$

Comparison:

$$\frac{-2}{c} = \frac{-8}{c^3}$$

$$-2c^3 = -8c$$

$$0 = 2c^3 - 8c$$

$$0 = 2c(c^2 - 4)$$

$$0 = 2c(c-2)(c+2)$$

$$c = 0, c = 2, \text{ or } c = -2$$

$$c > 0, \text{ so } c = 2.$$

a?

$$a = \frac{-2}{c} = \frac{-2}{2} = -1$$

$$\therefore y = -1(2)^x$$