

7-2 Reteaching

Properties of Exponential Functions

There are four types of transformations that can change the graph of an exponential function.

Stretches

The factor a in $y = ab^x$ can stretch the graph of an exponential function when

$$|a| > 1$$

Reflections

The factor a in $y = ab^x$ can reflect the graph of an exponential function in the x -axis when

$$a < 0$$

Compressions

The factor a in $y = ab^x$ can compress the graph of an exponential function when

$$0 < |a| < 1$$

Translations

The graph of an exponential function translates horizontally by h ; vertically by k .

$$y = ab^{(x-h)} + k$$

Problem

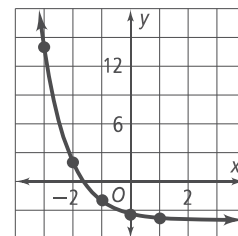
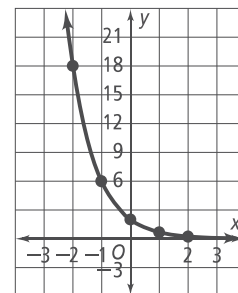
How does the graph of $y = 2\left(\frac{1}{3}\right)^{x+1} - 4$ compare to the parent function $y = 2\left(\frac{1}{3}\right)^x$?

Step 1 Determine the base of the function $y = 2\left(\frac{1}{3}\right)^x$. Because $b < 1$, the graph will represent exponential decay.

Step 2 Make a table. Find more values if necessary to get a good picture of the graph.

x	$y = 2\left(\frac{1}{3}\right)^x$	y
-2	$2\left(\frac{1}{3}\right)^{-2} = 2(9)$	18
-1	$2\left(\frac{1}{3}\right)^{-1} = 2(3)$	6
0	$2\left(\frac{1}{3}\right)^0 = 2(1)$	2
1	$2\left(\frac{1}{3}\right)^1 = 2\left(\frac{1}{3}\right)$	$\frac{2}{3}$
2	$2\left(\frac{1}{3}\right)^2 = 2\left(\frac{1}{9}\right)$	$\frac{2}{9}$

Step 3 Use the values for x and y from the table to graph the function.



Step 4 For $y = 2\left(\frac{1}{3}\right)^{x+1} - 4$, $h = -1$ and $k = -4$. Shift the graph of the parent function above 1 unit left and 4 units down. The horizontal asymptote shifts down as well, from $y = 0$ to $y = -4$.

Step 5 Use a graphing calculator to check your graph.

