Exercises

1. Consider an exponential function of the form $f(x) = a \cdot 2^{b(x-h)} + k$.

    a. If $f(x)$ is an increasing function, can it be transformed into a decreasing function by changing only the parameters h and k?

    b. In which of the following cases is the function $f(x)$ increasing?

        i. $a > 0$ and $b > 0$

        ii. $a > 0$ and $b < 0$

        iii. $a < 0$ and $b > 0$

        iv. $a < 0$ and $b < 0$

2. Determine the value of k if $y = 2^{10x+7}$ and $y = 16 \cdot 2^{10x+k}$ produce the same graph.

3. Determine the x-intercept of the curve $y = 5 \cdot 2^{x+8} - 160$.

4. It turns out that any transformed exponential function with base c can be written without the horizontal transformation parameter — that is, it can be written in the form $f(x) = a \cdot c^{bx} + k$. Rewrite the function $g(x) = 5 \cdot 3^{3x+2} + 7$ in this form.

5. Graph each of the following exponential curves, labelling the y-intercept and horizontal asymptote:

    a. $y = 2^{3x+2}$

    b. $y = -2 \cdot 5^{\frac{x}{2}} + 3$

    c. $y = 4^{-(x-2)} - 9$

6. In this lesson, we showed that the basic exponential curve $y = 3^x$ could be transformed into the curve $y = 2 \cdot 3^{-(x-1)} - 3$ by applying the following sequence of transformations:

i. A vertical stretch by a factor of 2.

ii. A reflection in the y-axis.

iii. A horizontal translation by 1 unit to the right.

iv. A vertical translation by 3 units down.

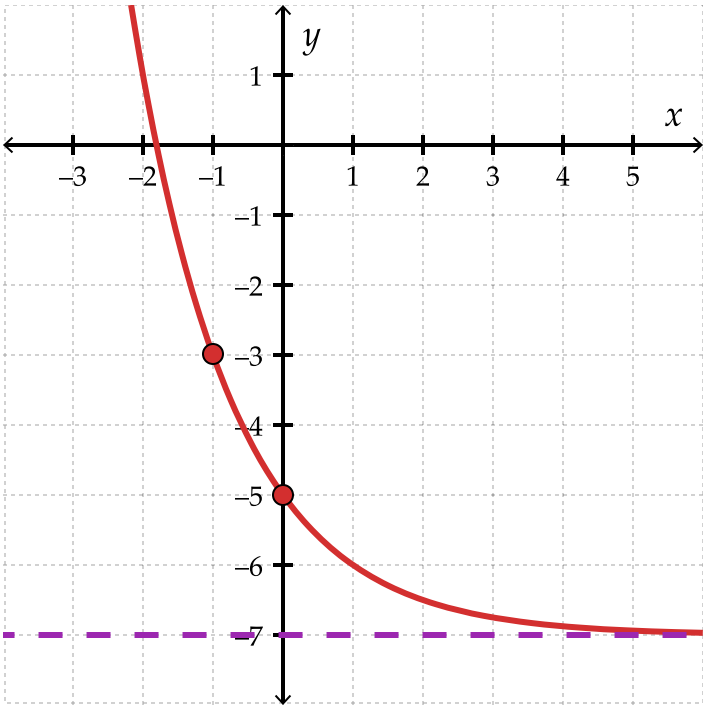
Find a different sequence of transformations which transform the basic exponential curve $y = 3^x$ into $y = 2 \cdot 3^{-(x-1)} - 3$.

7. If $f(x) = 3^x$ and $f(x+2) + f(x+3) + f(x+4) = kf(x)$, what is the value of k?

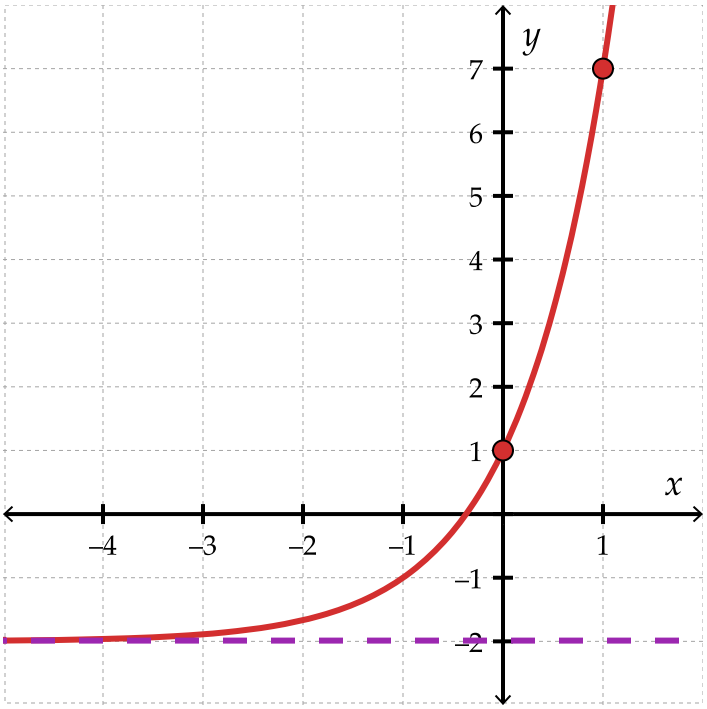
Meisel, R. W., Petro D., Speijer, J., Stewart K., & Vukets, B. (2009). *Functions 11*. Toronto: McGraw-Hill Ryerson.

8. Each graph depicts a curve $y = f(x)$, where $f(x)$ is an exponential function of the form $f(x) = a \cdot c^{b(x-h)} + k$. In each case, determine an equation for $f(x)$ with the given values for the base and horizontal translation parameter.

a. Base $c = 2$ and horizontal translation parameter $h = 0$.

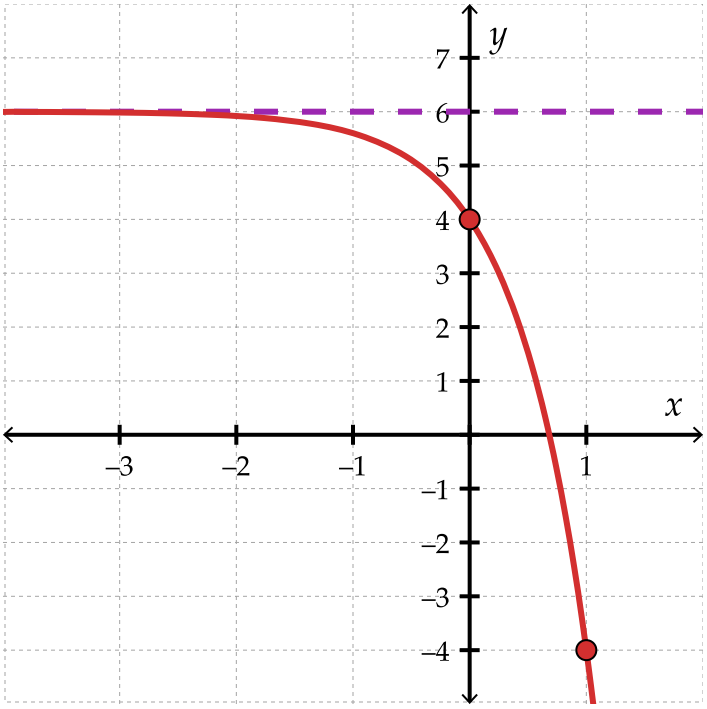


b. Base $c = 3$ and horizontal translation parameter $h = -1$.



9. Each graph depicts a curve $y = f(x)$ where $f(x)$ is an exponential function of the form $f(x) = a \cdot c^{b(x-h)} + k$. In each case, determine an equation for $f(x)$ with the given values for the base and horizontal translation parameter.

   a. Base $c = 5$ and horizontal translation parameter $h = 0$.



   b. Base $c = 2$ and horizontal translation parameter $h = 4$.