Exercise 68

For the following exercises, write a formula for the function g that results when the graph of a given toolkit function is transformed as described.

The graph of $f(x) = x^2$ is horizontally stretched by a factor of 3, then shifted to the left 4 units and down 3 units.

Solution

To horizontally stretch the graph by a factor of 3, replace x with $(1/3)x$.

$$\left(\frac{1}{3}x\right)^2$$

To then shift it to the left 4 units, replace x with $x + 4$.

$$\left[\frac{1}{3}(x+4)\right]^2$$

To then shift it down 3 units, subtract 3 from the function.

$$g(x) = \left[\frac{1}{3}(x+4)\right]^2 - 3$$