

Applications:

1. a) If you want to apply a horizontal translation 4 units to the right and a translation 5 units up to the function $f(x) = \sqrt{x}$, what will the equation of the new function g be?

$$g(x) = \sqrt{x-4} + 5$$

- b) Apply a reflection around the x -axis and a horizontal stretch factor $\frac{1}{3}$ to the function g . What will the equation of the new function h be?

$$\begin{aligned} h(x) &= -g\left(\frac{1}{3}x\right) \\ &= -\left(\sqrt{\frac{1}{3}x-4} + 5\right) \end{aligned}$$

- c) Which transformations would you use to go directly from f to h ?

$$h(x) = -\sqrt{\frac{1}{3}(x-12)} - 5$$

- reflection around the x -axis
- horizontal stretch factor $\frac{1}{3}$
- horizontal translation 12 units to the right
- vertical translation 5 units down.

2. a) If you want to apply a horizontal stretch factor $\frac{1}{2}$ and a reflection around the x -axis to the graph of f , what will the equation of the function be?

$$y = -f(2x)$$

- b) Do it to $f(x) = 3(x-4)^2 - 1$.

$$y = -\left(3(2x-4)^2 - 1\right) \quad y = -12(x-2)^2 + 1$$

- c) If you want to compare the graph of the function you just got on question b. to the graph of $y = x^2$, which transformations would you use in the right order?

- reflection around the x -axis
- vertical stretch factor 12
- horizontal translation 2 units to the right
- vertical translation 1 unit up.

Your turn:

1) a) If you want to apply a horizontal stretch factor 2 and a translation 4 units down to the function, $f(x) = x^2$, what will the equation of the new function g be?

$$g(x) = f\left(\frac{1}{2}x\right) - 4$$

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

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

b) Apply a reflection around both axis and a horizontal translation 3 units to the left to the function g . What will the equation of the new function h be?

$$h(x) = -g(-(x+3))$$

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

$$h(x) = -\frac{1}{4}(x+3)^2 + 4$$

c) Which transformations would you use to go directly from f to h ?

- reflection around the x -axis
- vert. stretch factor $\frac{1}{4}$ (or horizontal stretch factor 2)
- translation 3 units to the left
- translation 4 units up

2) a) If you want to apply a vertical stretch factor 5 and a reflection around the y -axis to the graph of a function f , what will the expression be?

$$y = 5f(-x)$$

b) Do it to $y = \sqrt{x}$ and then to $y = 2\sqrt{x+4} - 3$.

$$y = 5\sqrt{-x}$$

$$y = 5(2\sqrt{-x+4} - 3)$$

c) If you want to compare the graph of the second function you just got on b) to the graph of $y = \sqrt{x}$, which transformations would you use in the right order?

$$y = 10\sqrt{-(x-4)} - 15$$

- vertical stretch factor 10
- reflection around the y -axis
- translation 4 units to the right
- translation 15 units down