Summary of Function Transformations

outside – vertical

$$y = Af\big(B(x+h)\big) + k$$

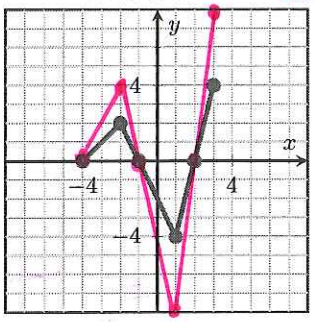
inside – horizontal

The graph of $y = Af\big(B(x+h)\big) + k$ is a transformation of the graph of $y = f(x)$. The transformations can be done in the following order:

- A: The function stretches or compresses vertically by a factor of $|A|$. If A is negative, the function also reflects across the x-axis.
- B: The function stretches or compresses horizontally by a factor of $\frac{1}{|B|}$. If B is negative, the function also reflects across the y-axis.
- h: The function shifts horizontally by h units. If $h > 0$, the function shifts left. If $h < 0$, the function shifts right.
- k: The function shifts vertically by k units. If $k > 0$, the function shifts up. If $k < 0$, the function shifts down.

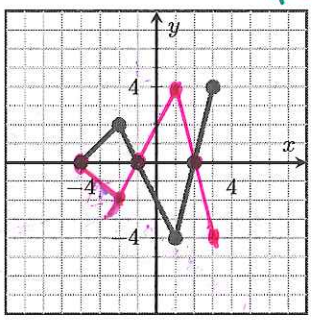
$y = 2f(x)$ vertical stretch

Figure 1



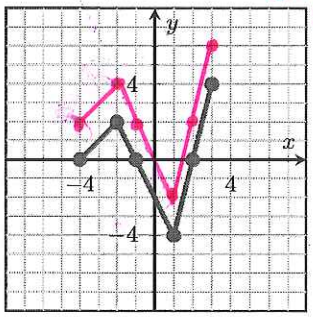
$y = -f(x)$ vertical flip

Figure 2



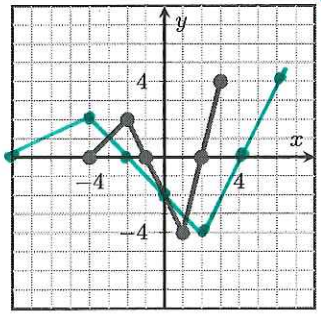
$y = f(x) + 2$ vertical shift up 2

Figure 3



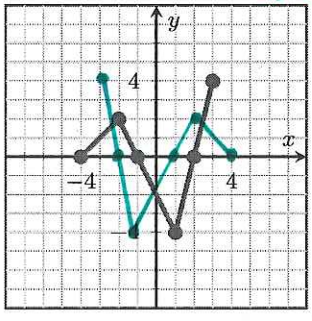
$y = f(\frac{1}{2}x)$ horizontal stretch by 2

Figure 4



$y = f(-x)$ horizontal flip

Figure 5



$y = f(x + 2)$ horizontal shift left 2

Figure 6