

Transforming Graphs of Functions (§2.4)

Translations

Let c be a positive number. Changes in the graph of $y = f(x)$ are represented as follows.

1. Vertical shift c units *upward*: $h(x) = f(x) + c$
2. Vertical shift c units *downward*: $h(x) = f(x) - c$
3. Horizontal shift c units to the *right*: $h(x) = f(x - c)$
4. Horizontal shift c units to the *left*: $h(x) = f(x + c)$

Reflections

Reflections in the axes of the graph of $y = f(x)$ are represented as follows.

1. Reflection in the x -axis: $h(x) = -f(x)$
2. Reflection in the y -axis: $h(x) = f(-x)$

Scalings

1. If $a > 1$ then $h(x) = af(x)$ is a y -dilation.
2. If $0 < a < 1$ then $h(x) = af(x)$ is a y -compression.
3. If $b > 1$ then $h(x) = f(bx)$ is an x -compression.
4. If $0 < b < 1$ then $h(x) = f(bx)$ is an x -dilation.