Algebra 2 Chapter 1: A Summary of Transformations

Horizontal Translation (right or left)	Vertical Translation (up or down)
$(x, y) \rightarrow (x + h, y)$	$(x, y) \rightarrow (x, y + k)$

Reflection Across *x*-axis	Reflection Across *y*-axis
$(x, y) \rightarrow (x, -y)$	$(x, y) \rightarrow (-x, y)$

In a stretch or compression, the new figure has a different shape than the original.

Horizontal Stretch (away from *y*-axis)	The *x*-coordinate changes. $(x, y) \rightarrow (bx, y)$; $\|b\| > 1$
Vertical Stretch (away from *x*-axis)	The *y*-coordinate changes. $(x, y) \rightarrow (x, ay)$; $\|a\| > 1$
Horizontal Compression (toward the *y*-axis)	The *x*-coordinate changes. $(x, y) \rightarrow (bx, y)$; $0 < \|b\| < 1$
Vertical Compression (toward the *x*-axis)	The *y*-coordinate changes. $(x, y) \rightarrow (x, ay)$; $0 < \|a\| < 1$

When working with nonlinear functions and using function notation:

Horizontal Translation ⇔ Use $f(x) \rightarrow f(x - h)$. $h > 0$, shift right; $h < 0$ shift left	**Vertical Translation** ⇕ Use $f(x) \rightarrow f(x) + k$. $k > 0$, shift up; $k < 0$ shift down

Reflection across *x*-axis Use $f(x) \rightarrow -f(x)$.	**Reflection across *y*-axis** Use $f(x) \rightarrow f(-x)$.

Vertical compression or horizontal stretch Use $f(x) \rightarrow a(f(x))$, $0 < \|a\| < 1$	**Vertical stretch or horizontal compression** Use $f(x) \rightarrow a(f(x))$, $\|a\| > 1$

For linear functions, translating a linear function horizontally or vertically will not change the slope. Stretching or compressing a function will change the slope.

Horizontal Translation ⇔ Use $f(x) \rightarrow f(x - h)$. $h > 0$, shift right; $h < 0$ shift left	**Vertical Translation** ⇕ Use $f(x) \rightarrow f(x) + k$. $k > 0$, shift up; $k < 0$ shift down
Horizontal stretch or compression by a factor of *b* Use $f(x) \rightarrow f\left(\frac{1}{b}x\right)$	**Vertical stretch or compression by a factor of *a*** Use $f(x) \rightarrow a \cdot f(x)$.
Reflection across *x*-axis Use $f(x) \rightarrow -f(x)$.	**Reflection across *y*-axis** Use $f(x) \rightarrow f(-x)$.