

Transformation Rules for Functions

Function Notation	Type of Transformation	Change to Coordinate Point
$f(x) + d$	Vertical translation up d units	$(x, y) \rightarrow (x, y + d)$
$f(x) - d$	Vertical translation down d units	$(x, y) \rightarrow (x, y - d)$
$f(x + c)$	Horizontal translation left c units	$(x, y) \rightarrow (x - c, y)$
$f(x - c)$	Horizontal translation right c units	$(x, y) \rightarrow (x + c, y)$
$-f(x)$	Reflection over x-axis	$(x, y) \rightarrow (x, -y)$
$f(-x)$	Reflection over y-axis	$(x, y) \rightarrow (-x, y)$
$af(x)$	Vertical stretch for $ a > 1$	$(x, y) \rightarrow (x, ay)$
	Vertical compression for $0 < a < 1$	
$f(bx)$	Horizontal compression for $ b > 1$	$(x, y) \rightarrow \left(\frac{x}{b}, y\right)$
	Horizontal stretch for $0 < b < 1$	