

Rules for Transformation of Linear Functions

Transformation	Function	Description
Horizontal Shift	$f(x + h)$	Shift left h units
	$f(x - h)$	Shift right h units
Vertical Shift	$f(x) + k$	Shift up k units
	$f(x) - k$	Shift down k units
Reflection	$-f(x)$	Reflect across x-axis
	$f(-x)$	Reflect across y-axis
Vertical Stretch/Compress	$a f(x), a > 1$	Stretch vertically by a factor of a
	$a f(x), 0 < a < 1$	Compress vertically by a factor of a
Horizontal Stretch/Compress	$f(ax), a > 1$	Compress horizontally by a factor of $\frac{1}{a}$
	$f(ax), 0 < a < 1$	Stretch horizontally by a factor of $\frac{1}{a}$

Transformation Rules

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 > 0$	$(x, y) \rightarrow (x, ay)$
$af(x)$	Vertical compression for $0 < a < 1$	$(x, y) \rightarrow (x, ay)$
$f(bx)$	Horizontal compression for $ b > 0$	$(x, y) \rightarrow \left(\frac{x}{b}, y \right)$
$f(bx)$	Horizontal stretch for $0 < b < 1$	$(x, y) \rightarrow \left(\frac{x}{b}, y \right)$