Linear Transformations of Functions

$$f(x) \to \underset{③}{a}\, f(\, \underset{②}{b}\, x + \underset{①}{c}\,) + \underset{④}{d}$$

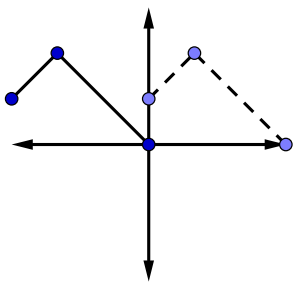
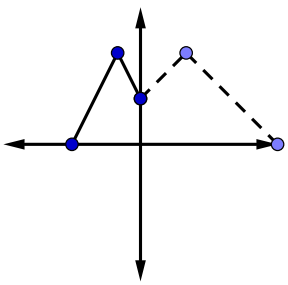
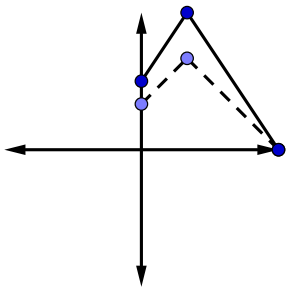
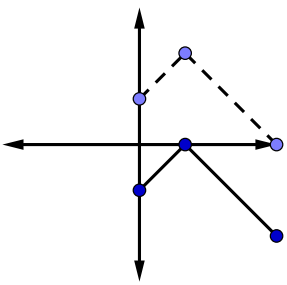
Transformation Types

①	②	③	④
Horizontal Translation by $-c$ units.	Horizontal Dilation by scale factor $\frac{1}{b}$.	Vertical Dilation by scale factor a.	Vertical Translation by d units.

Descriptions

①	②	③	④
Each point on the function is translated c units left.	The distance each point is from the y axis is multiplied by $\frac{1}{b}$.	The distance each point is from the x axis is multiplied by a.	Each point on the function is translated d units up.

Example

①	②	③	④
Let $c = 3$	Let $b = -2$	Let $a = \frac{3}{2}$	Let $d = -2$
$f(x) \to f(x+3)$	$f(x) \to f(-2x)$	$f(x) \to \frac{3}{2}f(x)$	$f(x) \to f(x) - 2$
			

Co-ordinate

$$(x, y) \to \left(\frac{x-c}{b}, ay + d\right)$$