

# Function Translations

A. I. Assistant

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## Function Translation Rules

### Transformation Rules

The following table summarizes the rules for vertical translation of a function  $y = f(x)$ .

Table 1: Translation Rules

Function	Vertical Translation	Result	Point
$y = f(x)$	<b>Upward</b> by $k$ units	$y = f(x) + k$	$(x, y + k)$
$y = f(x)$	<b>Downward</b> by $k$ units	$y = f(x) - k$	$(x, y - k)$
$y = f(x)$	<b>Right</b> by $h$ units	$y = f(x - h)$	$(x - h, y)$
$y = f(x)$	<b>Left</b> by $h$ units	$y = f(x + h)$	$(x + h, y)$
$y = f(x)$	<b>Stretch</b> by $h$ units	$y = f(x - h)$	$(x - h, y)$
$y = f(x)$	<b>LeSft</b> by $h$ units	$y = f(x + h)$	$(x + h, y)$

### Parent Translation

The following table summarizes the rules for horizontal translation of a function  $y = f(x)$ .

Table 2: Translating  $f(x) = x^2$

Function	Vertical Translation	Result	Point
$y = x^2$	<b>Upward</b> by $k$ units	$y = x^2 + k$	$(x, y + k)$
$y = x^2$	<b>Downward</b> by $k$ units	$y = x^2 - k$	$(x, y - k)$
$y = x^2$	<b>Right</b> by $h$ units	$y = (x - h)^2$	$(x - h, y)$
$y = x^2$	<b>Left</b> by $h$ units	$y = (x + h)^2$	$(x + h, y)$
$y = x^2$	<b>Stretch</b> for $c \geq 1$	$y = 2f(x)$	$(x, 2y)$
$y = x^2$	<b>Shrink</b> for $0 <  c  < 1$	$y = \frac{1}{2}f(x)$	$(x, \frac{1}{2}y)$

## Quadratic Function Transformations

Function	Vertical Translation	Resulting Equation	Transformed Point
$y = x^2$	Upward by $k$ units	$y = x^2 + k$	$(x, y + k)$
$y = x^2$	Downward by $k$ units	$y = x^2 - k$	$(x, y - k)$

## Quadratic Function Transformations

Convert each of the following Transformations from function notation to words

$y = \frac{1}{2}f(x - 1) + 2$	$y = 5f(x) + 3$	$y = -2f(x + 1) - 2$	$y = f(x - 3) + 4$
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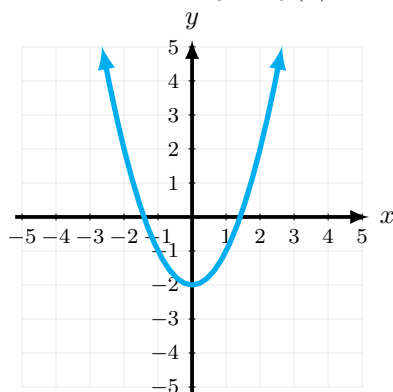
## Quadratic Function Transformations

If  $(3, 4)$  is a point on the graph  $f(x)$ , what ordered pair must also be on the graph of  $y$  using the same Transformation from above

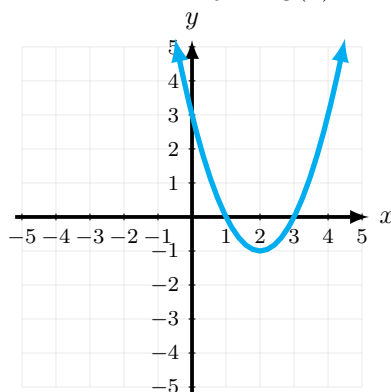
$y = \frac{1}{2}f(x-1) + 2$	$y = 5f(x) + 3$	$y = -2f(x+1) - 2$	$y = f(x-3) + 4$
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## Quadratic Function Transformations

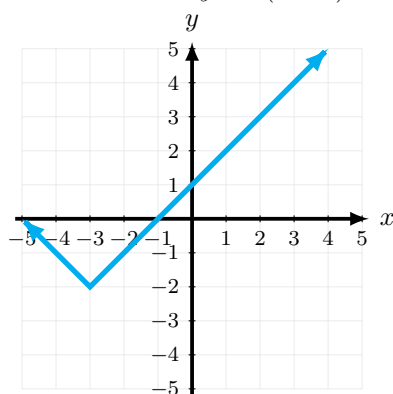
Adjust  $y = f(x)$  below with  
transformation  $y = 2f(x)$



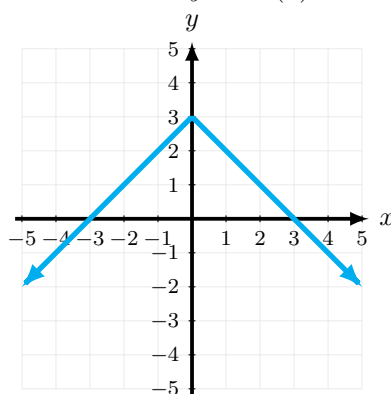
Adjust  $y = g(x)$  below with  
transformation  $y = -g(x)$



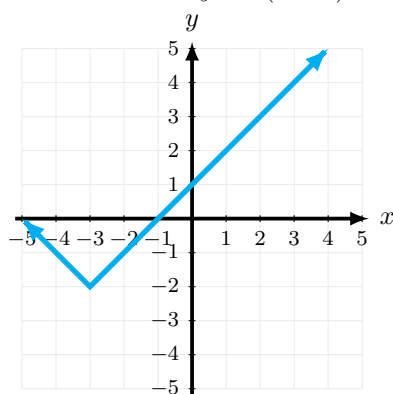
Adjust  $y = h(x)$  below with  
transformation  $y = h(x - 3)$



Adjust  $y = k(x)$  below with  
transformation  $y = -k(x) - 3$



Adjust  $y = h(x)$  below with  
transformation  $y = h(x - 3)$



Adjust  $y = k(x)$  below with  
transformation  $y = -k(x) - 3$

