

Transformations

ARCC Tutoring Services | 763-433-1260
Rapids: Math Skills Center, Room L-127
Cambridge: ASC, Room D-208

Operation	Transformation
Multiply/divide	Stretch/compress
Add/subtract	Shift
Multiply by -1	Reflect

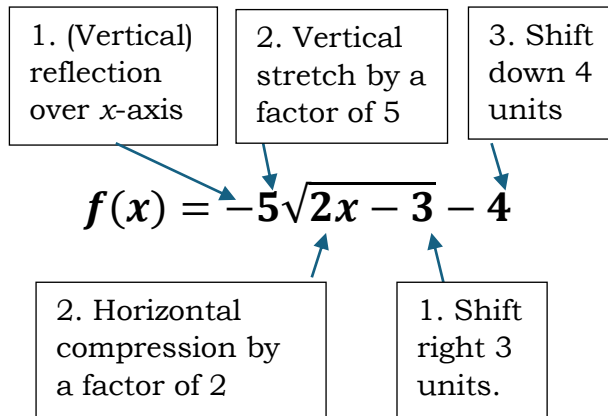
If the changes are...	then they affect..	and are implemented...
"outside" $f(x)$	y	as written, following order of operations
"inside" $f(x)$	x	"backwards," in the "opposite" order (like solving for x).

Transformation		Example
<i>Vertical...</i>		<i>Outside</i>
Stretch	$y = af(x)$ $a > 1$	$y = 2x^2$
Compress	$y = af(x)$ $0 < a < 1$	$y = \frac{1}{2}x^2$
Reflect over x -axis	$y = -f(x)$	$y = -x^2$
Shift up	$y = f(x) + k$ $k > 0$	$y = x^2 + 3$
Shift down	$y = f(x) - k$ $k > 0$	$y = x^2 - 3$
<i>Horizontal...</i>		<i>Inside</i>
Stretch	$y = f(ax)$ $0 < a < 1$	$y = \left(\frac{1}{2}x\right)^2$
Compress	$y = f(ax)$ $a > 1$	$y = (2x)^2$
Reflect over y -axis	$y = f(-x)$	$y = (-x)^2$
Shift right	$y = f(x - h)$ $h > 0$	$y = (x - 3)^2$
Shift left	$y = f(x + h)$ $h > 0$	$y = (x + 3)^2$

Transformations

Example

The "parent function" is $y = \sqrt{x}$.



[Old x] = 2 [New x] - 3		[New y] = -5 [Old y] - 4	
New x	Old x	Old y	New y
$0 = 2x - 3$ $x = 1.5$	0	0	$-5(0) - 4$ $= -4$
$1 = 2x - 3$ $x = 2$	1	1	$-5(1) - 4$ $= -9$
$4 = 2x - 3$ $x = 3.5$	4	2	$-5(2) - 4$ $= -14$
$9 = 2x - 3$ $x = 6$	9	3	$-5(3) - 4$ $= -19$

