FUNCTION TRANSFORMATIONS: ORDER OF OPERATIONS

$$y = a(bx - h) + k$$

Order	Constant	Transformation	Condition > Result
1	h	Horizontal Shift (Translation)	$h > 0$, graph **shifts right** h units. $h < 0$, graph **shifts left** $\|h\|$ units.
2	$-b$	Reflect About the *y*-Axis	$b < 0$, graph **reflects** about the *y*-axis.
3	b	Horizontal Compression or Horizontal Stretch	Each *x*-coordinate is multiplied by $\frac{1}{b}$. $b > 1$, graph **compresses horizontally** by factor of $\frac{1}{b}$. $0 < b < 1$, graph **stretches horizontally** by factor of $\frac{1}{b}$.
4	$-a$	Reflect About the *x*-Axis	$a < 0$, graph **reflects** about the *x*-axis.
5	a	Vertical Stretch or Vertical Compression (Shrink)	Each *y*-coordinate is multiplied by a. $a > 1$, graph **stretches vertically** by factor of a. $0 < a < 1$, graph **compresses (shrinks) vertically** by factor of a.
6	k	Vertical Shift (Translation)	$k > 0$, graph **shifts up** k units. $k < 0$, graph **shifts down** $\|k\|$ units.

Note:

- An alternative order is 4, 5, 6, 1, 2, 3. Either do all horizontal operations first, or do all vertical operations first.

Courtesy of **George Hartas**. Contributor: **Iain Rakowski**.