Transformations

Quick Reference

Function	Transformation	Direction	How?
$f(x)+k$	Vertical Translation	up if $k>0$ down if $k<0$	add k to each y-coordinate
$f(x-h)$	Horizontal Translation	right if $h>0$ left if $h<0$	add h to each x-coordinate
$a\cdot f(x)$	Stretch	vertical	multiply each y-coordinate by a
$f(b\cdot x)$	Stretch	horizontal	multiply each x-coordinate by $\frac{1}{b}$
$-f(x)$	Reflection	in x-axis	replace each y-coordinate with $-y$
$f(-x)$	Reflection	in y-axis	replace each x-coordinate with $-x$

A function is even if $f(x)=f(-x)$. The graph of an even function is symmetrical about the y-axis — for every point (x,y), there is a point $(-x,y)$.

A function is odd if $f(-x)=-f(x)$. The graph of an odd function is symmetrical about the origin — for every point (x,y), there is a point $(-x,-y)$.

Combining Transformations

Remember that when combining multiple transformations, you must first write the equation in the correct form:

$$y = a \cdot f\Big(b\big(x - h\big)\Big) + k$$

Once it is written correctly, transformations should always be performed in the following order.

1. Stretches or Compressions

2. Reflections

3. Translations