

GRAPHING TECHNIQUES

Given the graph of a function, the following techniques assist in graphing horizontal shifts, vertical shifts, flips and stretches.

HORIZONTAL SHIFT

Given: $y = f(x)$

Graph: $y = f(x-h)$

The $x-h$ tells you that you are going to shift the graph h units horizontally. So if you had $x-4$, that would be a horizontal shift 4 units to the right. If you had $x+3$ that would be a horizontal shift 3 units to the left.

VERTICAL SHIFT

Given: $y = f(x)$

Graph: $y = f(x)+k$

The $+k$ outside of the parentheses tells you the graph is going to be vertically shifted. Because the k isn't on the other side with the y , it is in the direction of the sign of k . If you have $y = f(x)+2$, the graph would be shifted up 2.

FLIP OVER THE X AXIS

Given: $y = f(x)$

Graph: $y = -f(x)$

The minus sign in front of the function says to change all of the y values to its opposite. This makes every point on the original graph have a mirror image over the x axis.

FLIP OVER THE Y AXIS

Given: $y = f(x)$

Graph: $y = f(-x)$

The minus sign in front of the x says to change all of the x values to its opposite. This makes every point on the original graph have a mirror image over the y axis.

STRETCHES/SHRINKS IN THE X DIRECTION

Given: $y = f(x)$

Graph: $y = f(cx)$

When x is replaced with cx , the graph will be stretched or shrunk in the x direction. The stretch or shrink tends to be opposite of what the number is. If x is replaced with $2x$, the graph will shrink. If x is replaced with $\frac{1}{4}x$, the graph will be stretched.

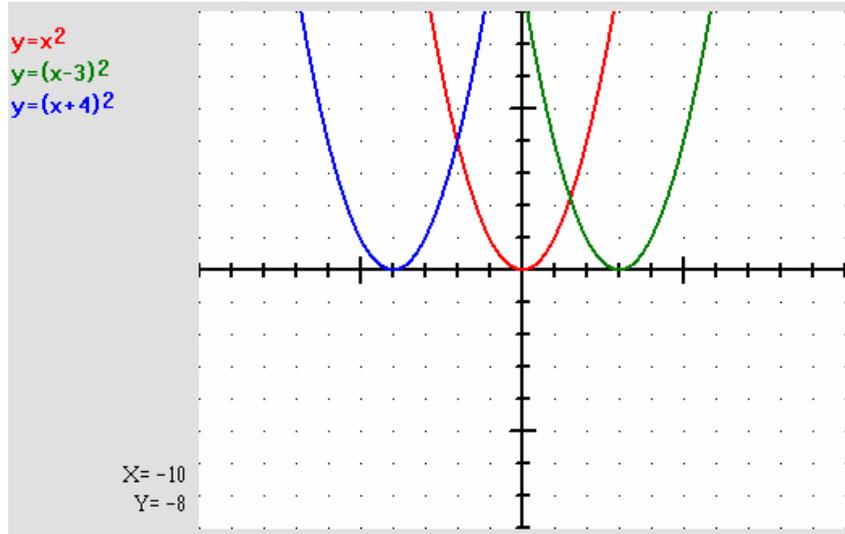
STRETCHES/SHINKS IN THE Y DIRECTION

Given: $y = f(x)$

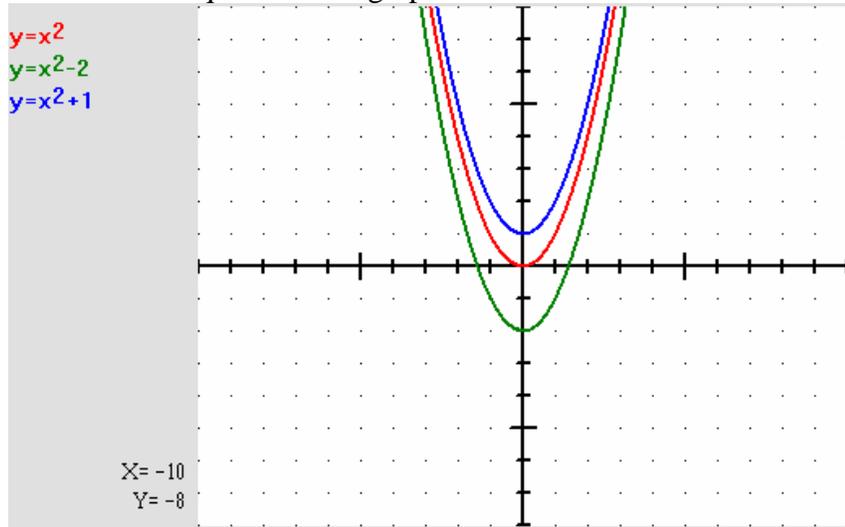
Graph: $y = C f(x)$

Multiplying the function by a constant, C , will stretch/shrink the graph in the vertical direction. The stretch or shrink tends to be what you would expect. If you had $y = 3 f(x)$, the graph would go up three times as fast as the original.

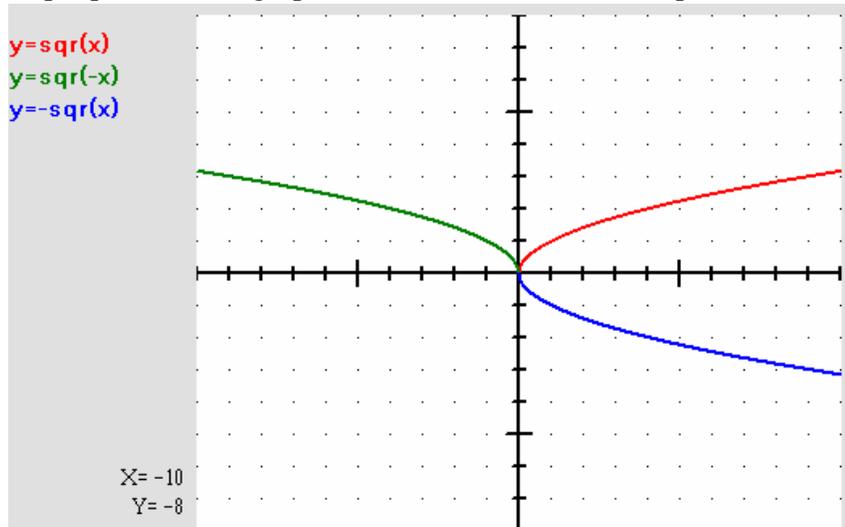
Horizontal shift equations and graphs



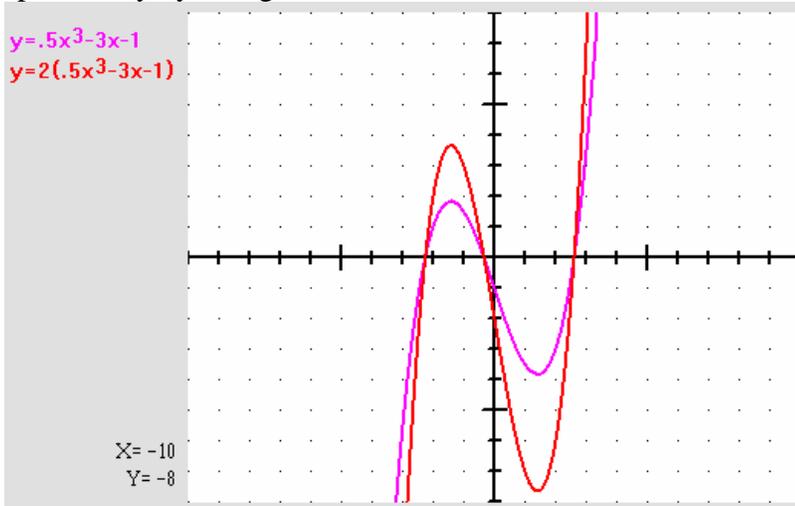
Vertical shift equations and graphs



Flip equations and graphs - note: In Green Globs $\text{sqr}(x) = \sqrt{x}$



Stretch and squish in the y direction. Note the parens around the entire equation and multiplied specifically by a single number.



Stretch and squish in the x direction. Note the parens around the x's and they are all replaced with multiplication by the same number.

