WARMUP

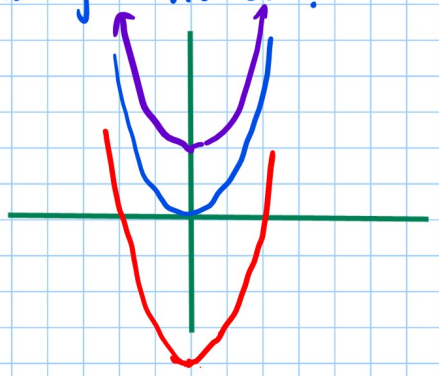
1) Graph on the same axes

$y = x^2$

$y = x^2 - 4$ ←

$y = x^2 + 2$ ←

What kind of a shift do you notice? Vertical



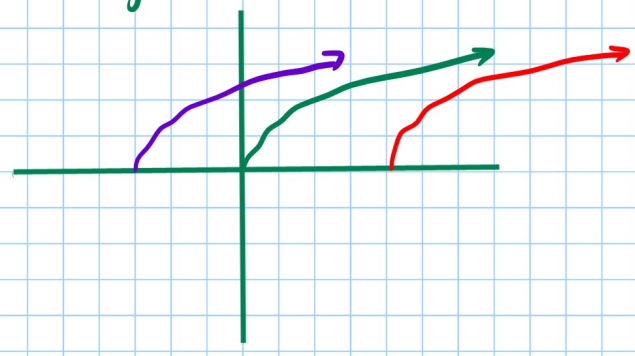
2) Graph on the same axes

$y = \sqrt{x}$

$y = \sqrt{x-4}$ ← 4 right

$y = \sqrt{x+3}$ ←

What kind of a shift do you notice?

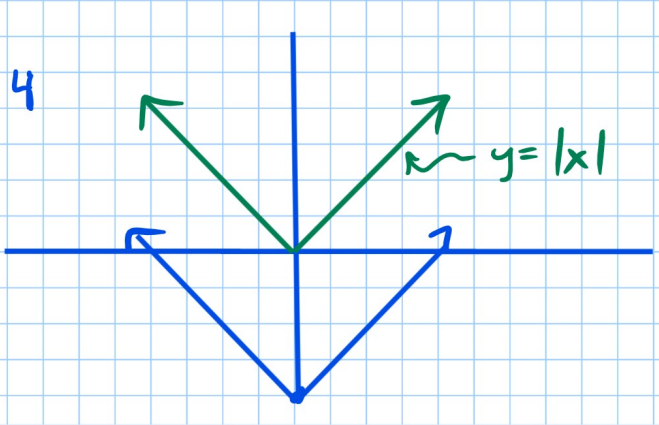


Section 2.4 Transformations

Vertical Shifts ($c > 0$)

- The graph of $y = f(x) + c$ is the graph of $y = f(x)$ shifted up c units
- The graph of $y = f(x) - c$ is the graph of $y = f(x)$ shifted down c units.

ex: $f(x) = |x| - 4$



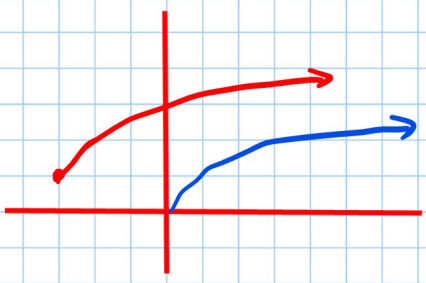
Horizontal Shifts ($c>0$)

The graph of $y=f(x-c)$ is the graph of $f(x)$ shifted c units to the right.

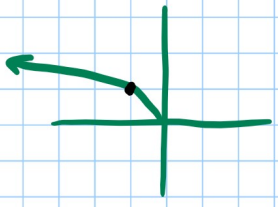
The graph of $y=f(x+c)$ is the graph of $f(x)$ shifted c units to the left.

ex: Graph $y=\sqrt{x+3}+1$

left 3 up 1



$f(x)=\sqrt{-x}$



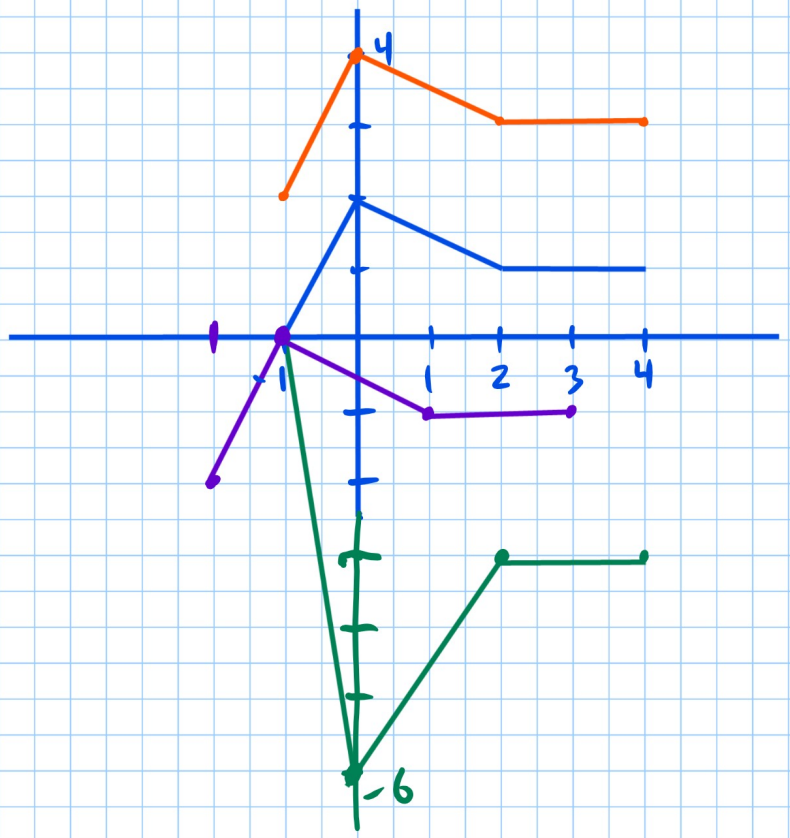
Reflecting

The graph of $y=-f(x)$ is the graph of $f(x)$ reflected about the x-axis

Stretching and Shrinking

$y=cf(x)$ is a vertical stretch if $c>1$

and a vertical shrink if $0<c<1$



$y = f(x) + 2$

$y = -3f(x)$

multiply y by -3

$(-1,0) \rightarrow (-1,0)$

$(0,2) \rightarrow (0,-6)$

$(2,1) \rightarrow (2,-3)$

$(4,1) \rightarrow (4,-3)$

$y = f(x+1) - 2$

left 1 down 2