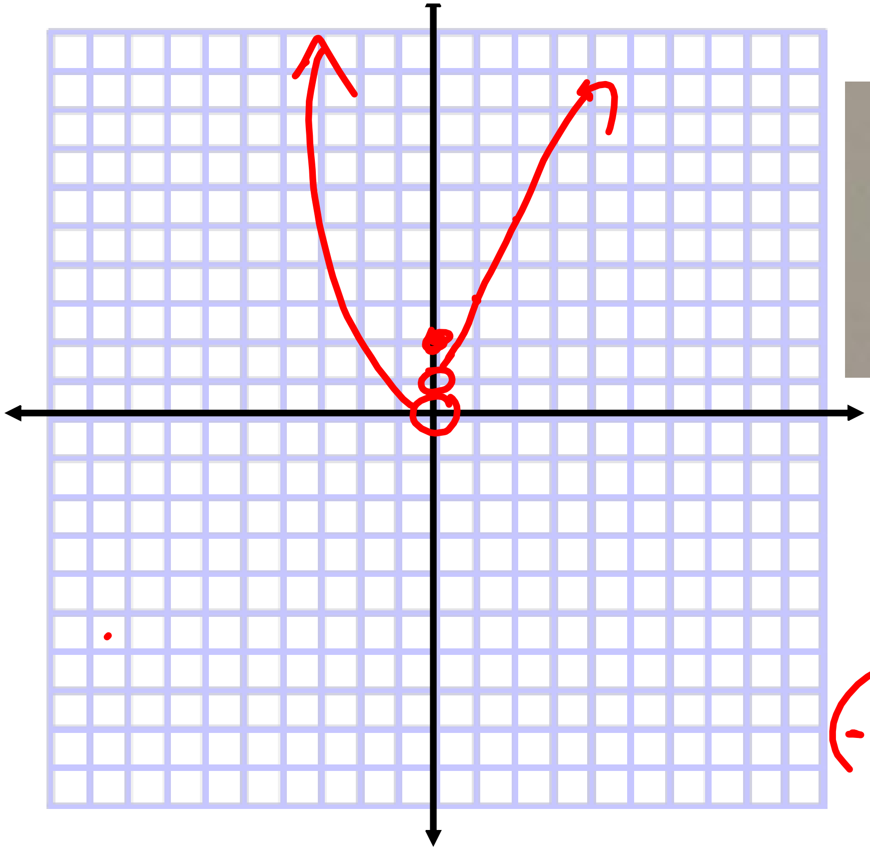


15. If $f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ 2 & \text{if } x = 0 \\ 2x + 1 & \text{if } x > 0 \end{cases}$

find: (a) $f(-2)$ (b) $f(0)$ (c) $f(2)$

$(0, \infty)$

$(-\infty, \infty)$

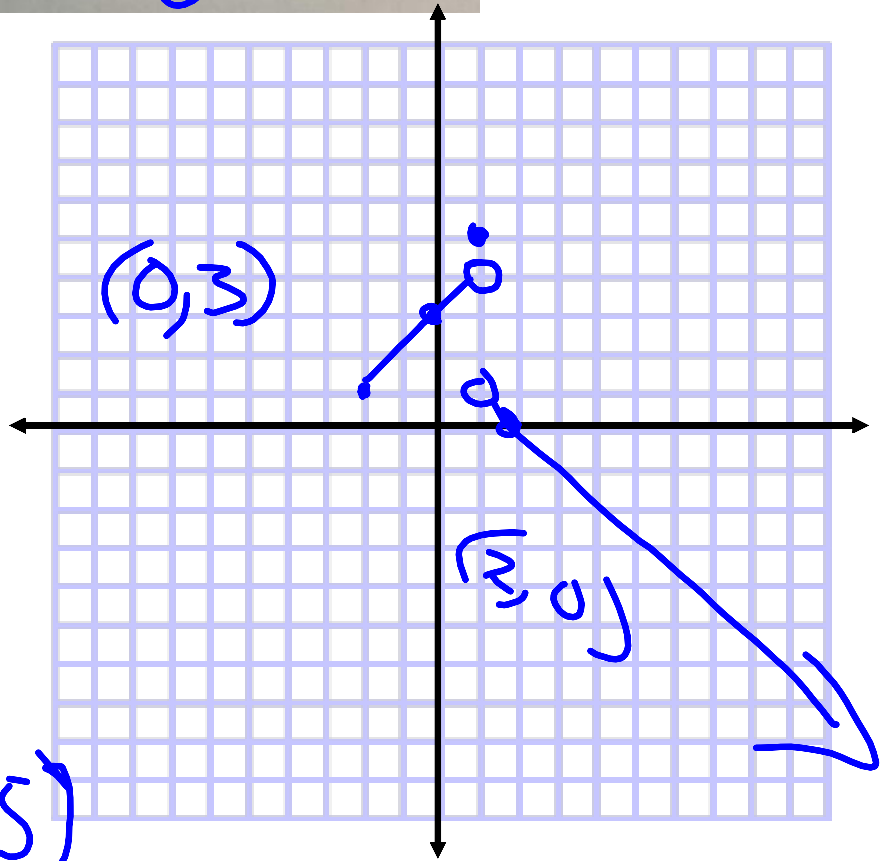
23. $f(x) = \begin{cases} x + 3 & -2 \le x < 1 \\ 5 & x = 1 \\ -x + 2 & x > 1 \end{cases}$

(a) Find the domain of each function.
(c) Graph each function by hand.
(e) Verify your results using a graphing utility.

(b) Locate any intercepts.
(d) Based on the graph, find the range.

$[-2, \infty)$

$(-\infty, 4) \cup [5, 5]$



We have memorized functions

We can use this to graph more complex functions,

if they are based on these.

$$f(x) = 4*(2x-5)^2 +7$$

This can be graphed by starting with $f(x)=x^2$
and accounting for the effects of the 4,2,5, and 7

Targets:

We want to describe, with proper terminology, transformations expressed in a function.

We want to be able to create a table for a transformed function.

We want to create a graph by transforming a base function.

Tricky bits:

Order

Terminology

Mr. Benjamin rule:

If you have two manipulations of x,
always get to the right form.

$$ax - h = a\left(x - \frac{h}{a}\right) \qquad 2x - 5 = 2\left(x - \frac{5}{2}\right)$$

Which is the actual visible left right shift?

$$\frac{h}{a}$$

f(x) is some function of x

f(x) makes a certain curve:

$$x \Rightarrow f(x) \Rightarrow (x, f(x))$$

But we can mess with the process

Do things to x before we run the function

$$x \Rightarrow \underline{b} * x - \underline{h} \Rightarrow b(x-h/b) \Rightarrow f(b(x-h/b))$$

After you run the function do things to the result.

$$\underline{a} * f(b(x-h/b)) + \underline{k} \Rightarrow (x, a*f(b(x-h/b))+k)$$

This result will have a similar, predictable shape to the original curve

Before changes are horizontal, after are vertical

f(x) is some function of x

f(x) makes a certain curve:

x=>f(x)=>(x,f(x))

But we can mess with the process

x=>2*x-5=>f(2(x-5/2))

2) Horizontal C/S

1) Horizontal shift

=>4*f(2(x-5/2))+7=>(x,4*f(2*x-5)+7)

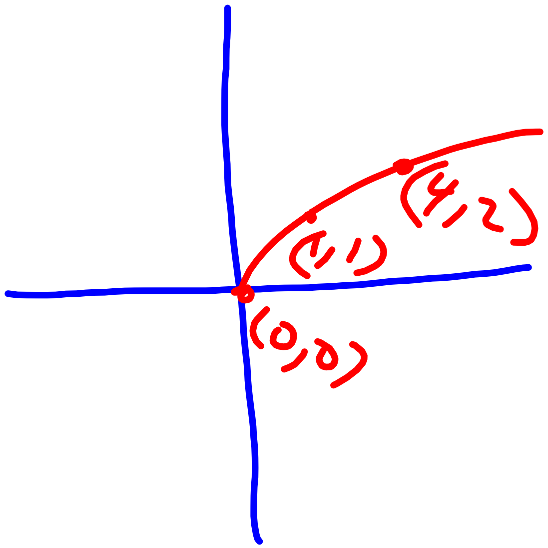
4) Vertical C/S

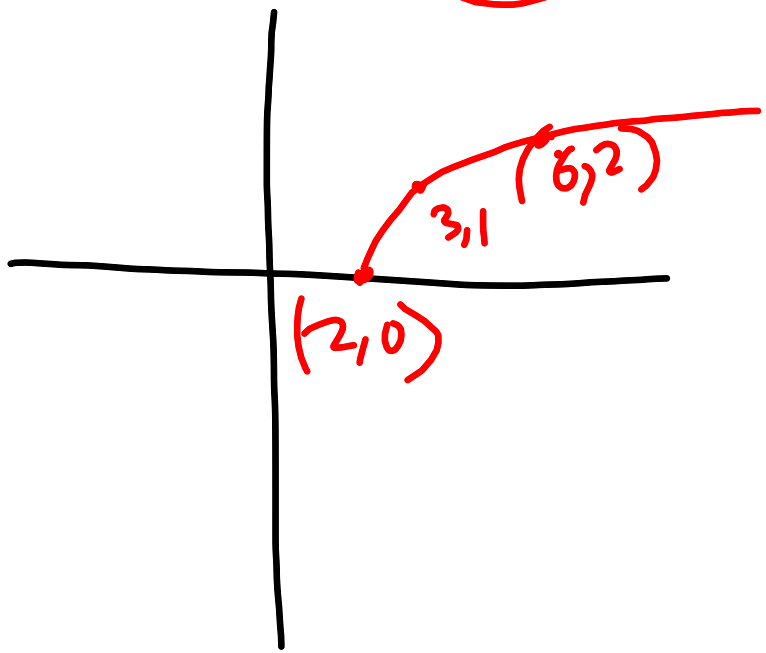
3) Vertical shift

Changes to x before you apply the function have a horizontal impact.
They turn each x into a different x
Changes to after the function has been executed have vertical impact.
They turn an answer into a different answer

IF A GRAPH HAS BOTH HORIZONTAL TRANSFORMATIONS YOU HAVE TO TAKE CARE
THE ORDER YOU DO MATTERS ON WHAT YOU ARE DOING

a*f(bx-h) + k $\quad f(x) = \sqrt{x-2} \quad f(x) = \sqrt{x}$





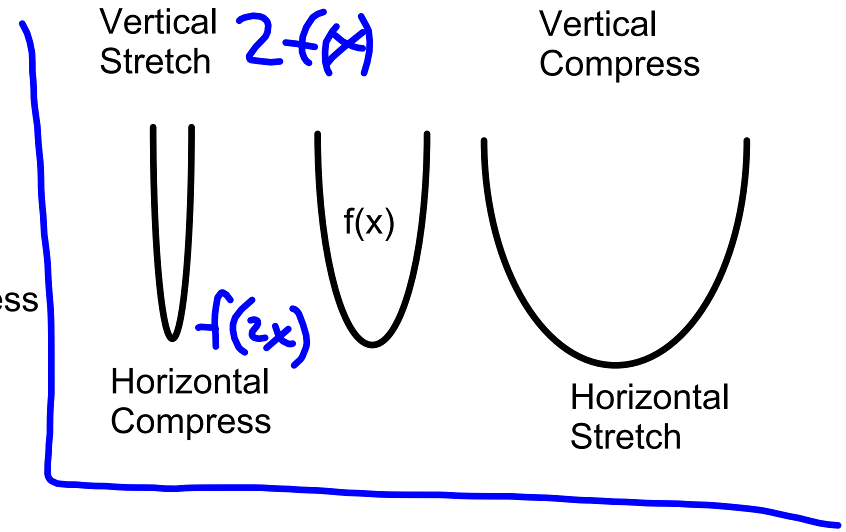
Order: Manipulating the graph

- **- h:** Shift right h
- **b:** x results from first step compress by 1/b
- **a:** Multiply all the y's by a
- +**k**: Move all the y's up k

Terminology:

Making it taller is a vertical stretch
Stretch for sky
Making wider is vertical compress
Compress down

Making it taller is a horizontal compress
Compress left to right
Making wider is horizontal stretch
Stretch wider



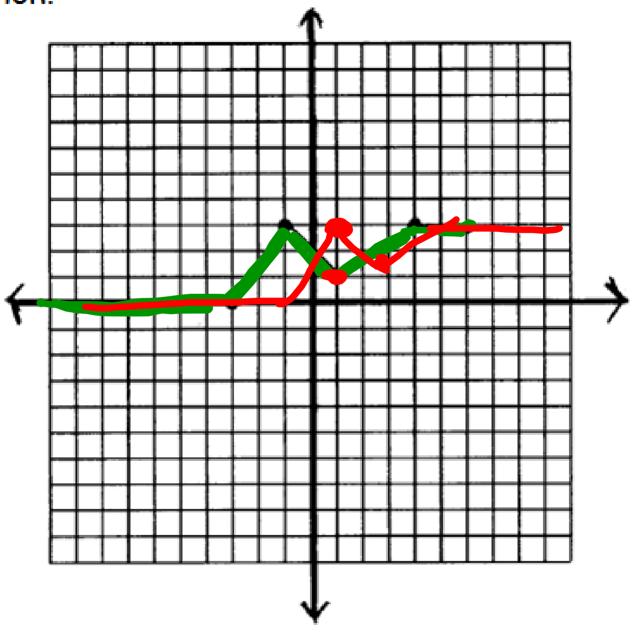
Horizontal C/S: bx
A large positive "b" makes a small x get the result that belongs to a big x.
Moving the results in. Compressing horizontally.
A fractional "b" makes a large x get the result that belongs to a small x.
Moving the results out. Stretching horizontally.

Vertical C/S:af(x)
A large positive "a" makes the answer bigger
Stretching the results up.
A fractional "a" makes the answers smaller
Compressing the result down.

according to the given transformation.

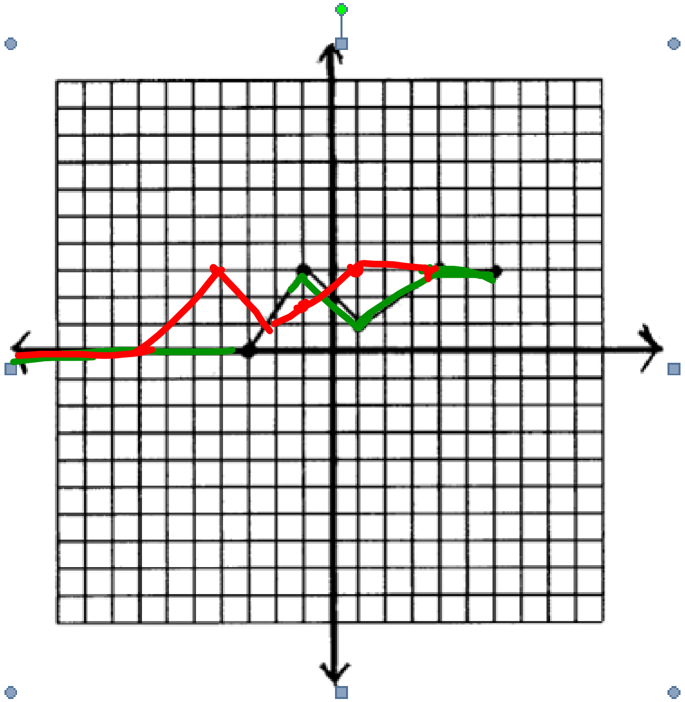
7) $f(x-2)$

	Old y	Old pt		New Y	New Pt
X	f(x)	(x,y)	x-2	f(x-2)	(x,y)
-3	0	(-3,0)	-5	0	(-3,0)
-1	3	(-1,3)	-3	0	(-1,0)
1	1	(1,1)	-1	3	(1,3)
4	3	(4,3)	2	1.5	(4,1.5)
6	3	(6,3)	4	3	(6,3)



8) $f(x+3)$

	Old y	Old pt		New Y	New Pt
X	f(x)	(x,y)	x+3	f(x+3)	(x,y)
-3	0	(-3,0)	0	2	(-3, 2)
-1	3	(-1,3)	2	1.5	(-1, 1.5)
1	1	(1,1)	4	3	(1, 3)
4	3	(4,3)	7	und	(4, -)
6	3	(6,3)	6	4 und	(6,)



Describe the transformation: ______________________

Attachments

transformer4.ggb