Name: _____ Date: March 6 Hour: ____Alg 1____

Unit 7A Day 5 and 6: Stretches and Compressions

Focus Question: How do I stretch or compress a function?

A. Today we will look at two more transformations: $kf(x)$ and $f(kx)$ where $f(x)$ is the function and k is some constant value. These transformations will stretch or compress a function

1. How is $kf(x)$ different from $f(kx)$? k is affecting the y / k is affecting the x
2. What does stretch mean? pull apart + extend
3. What does compress mean? push together + make smaller

B. Transformation: $kf(x)$

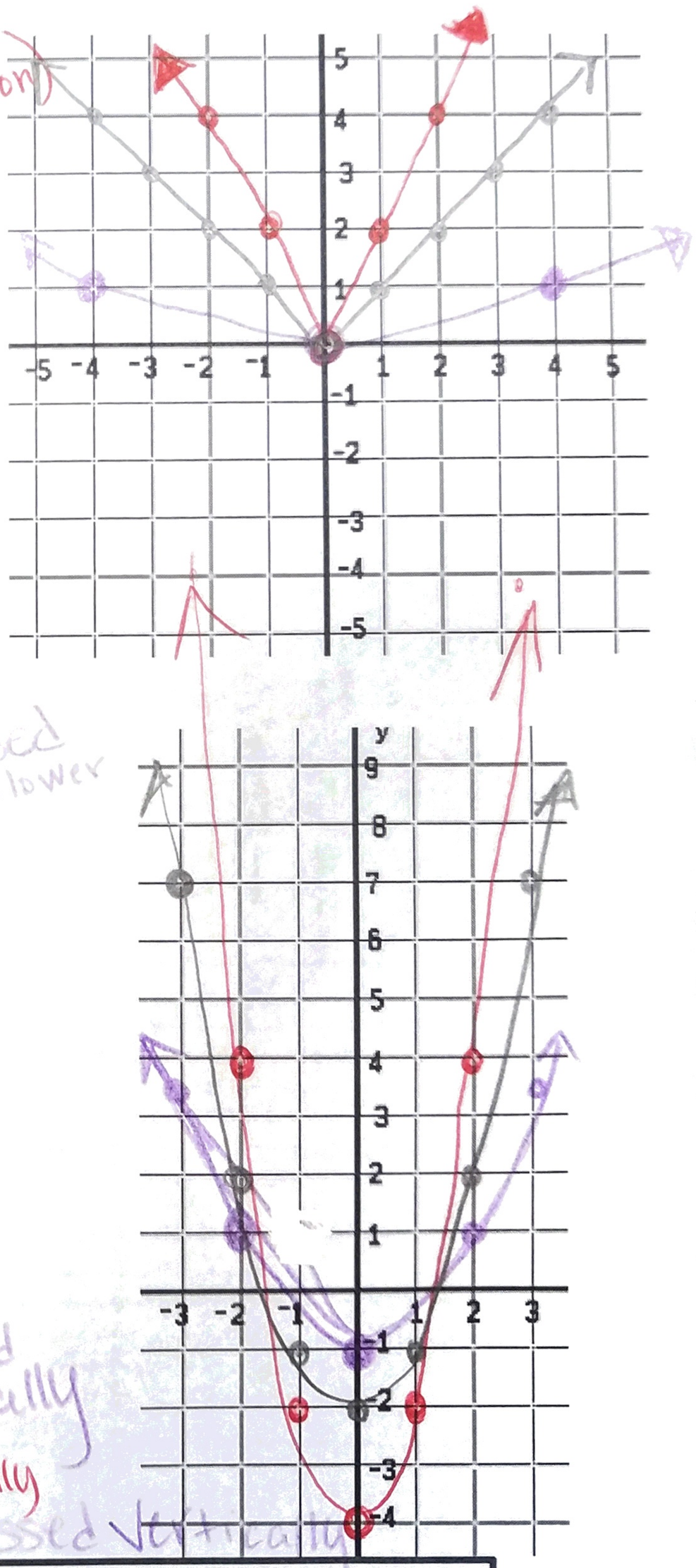
1. What does $kf(x)$ mean you do? multiplying the y (or multiply the entire function)

Use three different colors to graph each function

2)

Parent Function	$g(x) = 2f(x)$	$h(x) = \frac{1}{4}f(x)$
$f(x) = \lvert x \rvert$	$g(x) = 2\lvert x \rvert$	$h(x) = \frac{1}{4}\lvert x \rvert$
x | y	x | y 0 | 0 1 | 2 2 | 4	x | y 0 | 0 4 | 1

taller-faster / Vertically stretched / vertically compressed / rises slower



3)

original function	$g(x) = 2f(x)$	$h(x) = \frac{1}{2}f(x)$
$f(x) = x^2 - 2$ (parent, down 2)	$g(x) = 2x^2 - 4$	$h(x) = \frac{1}{2}x^2 - 1$
x | y -3 | 7 -2 | 2 -1 | -1 0 | -2	x | y 0 | -4 1 | -2 2 | 4 3 | 14	x | y 0 | -1 2 | 1 3 | 3.5

stretch vertically / compressed vertically

4) If $k > 1$, what does it do to the function? stretched vertically

5) If $0 < k < 1$ what does it do to the function? compressed vertically

6) What kind of transformation is $kf(x)$? Vertical stretch or compression

C. Transformation: f(kx)

1. What does $f(kx)$ mean you do?

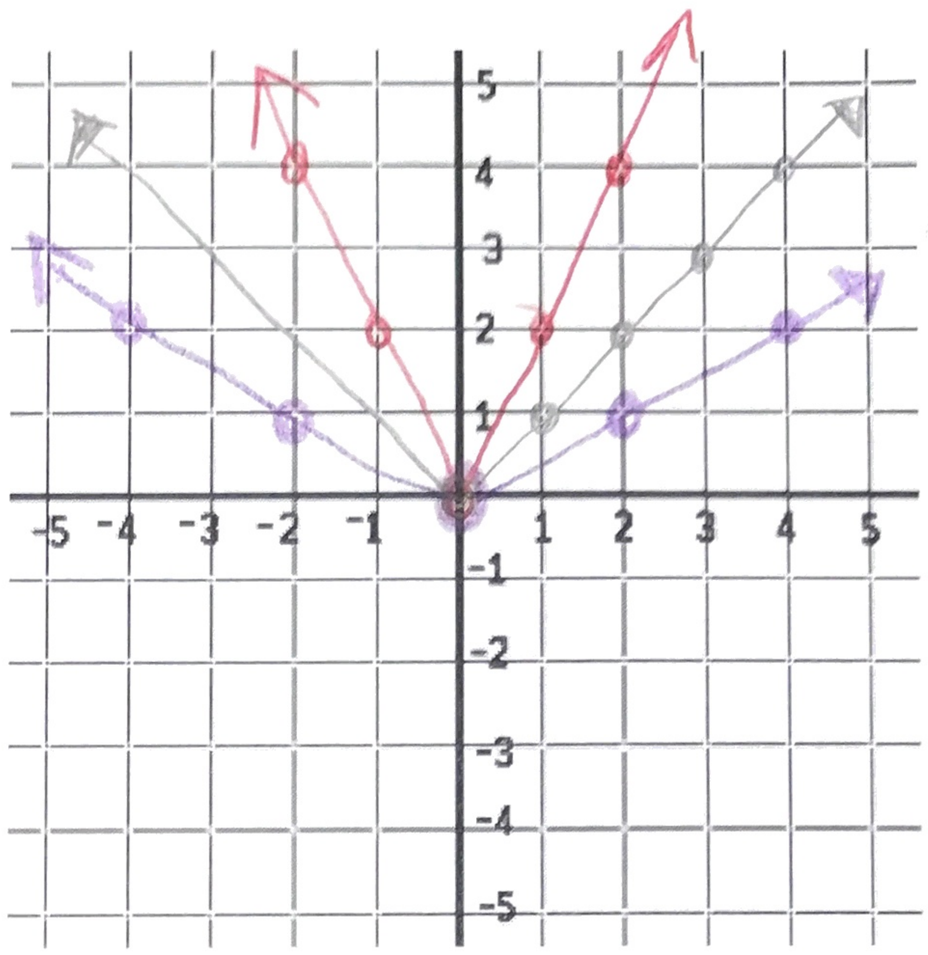
multiply the x

Use three different colors to graph each function

parent function	$g(x) = f(2x)$	$h(x) = f(\frac{1}{2}x)$
	12x1	
$f(x) = \|x\|$	$g(x) =$ 12x1	$h(x) =$ 1½x1
x | y	x | y	x | y
	0 | 0	0 | 0
	1 | 2	2 | 1
	2 | 4	4 | 2

compressed horizontally

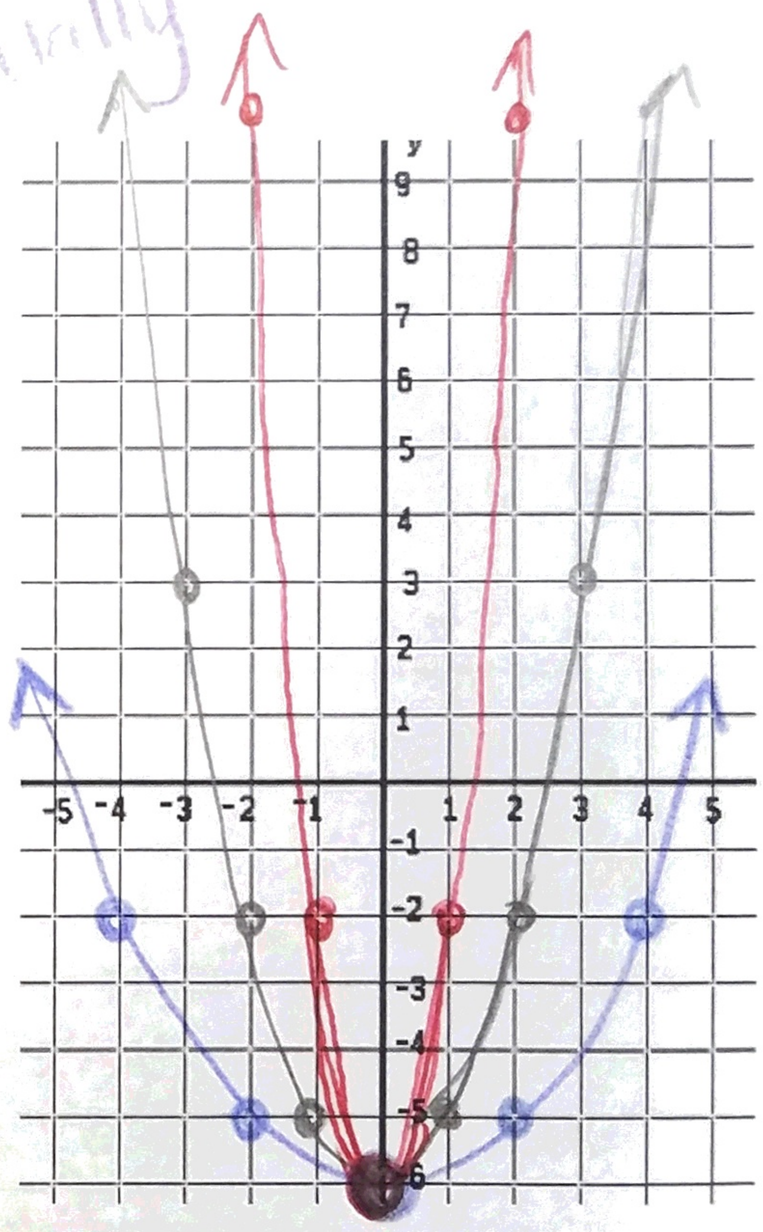
stretched horizontally



Original Parent function	$g(x) = f(2x)$	$h(x) = f(\frac{1}{2}x)$
	$(2x)^2 - 6$	$(\frac{1}{2}x)^2 - 6$
	2^2x^2	
$f(x) = x^2 - 6$	g(x) = $4x^2 - 6$	h(x) = $\frac{1}{4}x^2 - 6$
parent, down 6		
x | y	x | y	x | y
0 | -6	0 | -6	0 | -6
1 | -5	1 | -2	2 | -5
2 | -2	2 | 10	4 | -2
3 | 3		

compressed horiz.

Stretched horizontally



4) If $k > 1$, what does it do to the function?

compresses horizontally

5) If $0 < k < 1$, what does it do to the function?

stretch horizontally

6) What kind of transformation is $f(kx)$?

horizontal stretch or compression

Look back at your graph for $g(x) = 2|x|$ on the front and $g(x) = |2x|$ on this side. What do you notice about their graphs? they're identical

So, can you tell from a graph what transformation has occurred? Nope, you need the equation

This is because **vertical stretches** look identical to horizontal compressions and **vertical compressions** look identical to horizontal stretch. **You have to look at the equation.** is the k in the | | , or outside the | |

horizontally vertically

It is *easier* to tell on absolute value because either the k is with the x in the absolute value bars or in front of the absolute value bars.

D. Practice

Tell what transformations have occurred to each parent function.

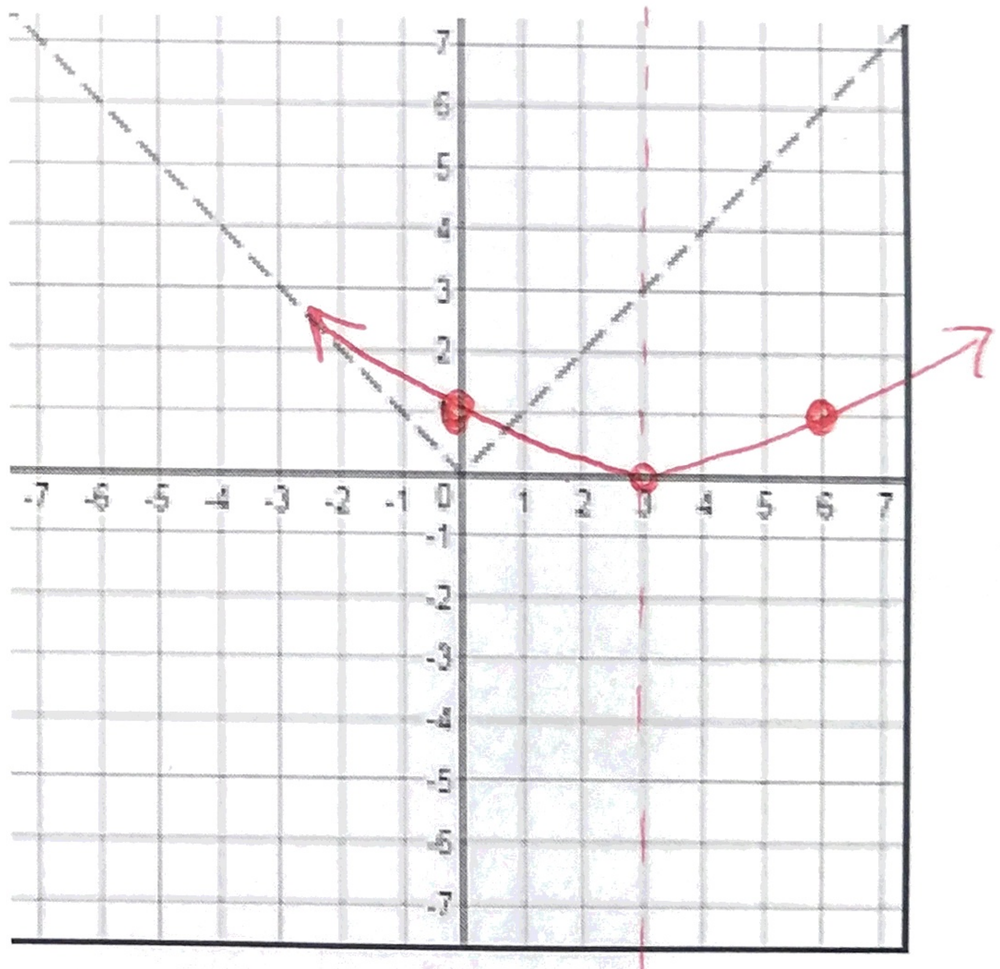
Then graph your answer to see if you are correct.

Give the vertex and a.o.s. for each graph.

1. $m(x) = \frac{1}{3}|x - 3|$

vertically compressed, right 3

x	y
3	0
6	1



a.o.s. $x = 3$

Vertex $(3, 0)$

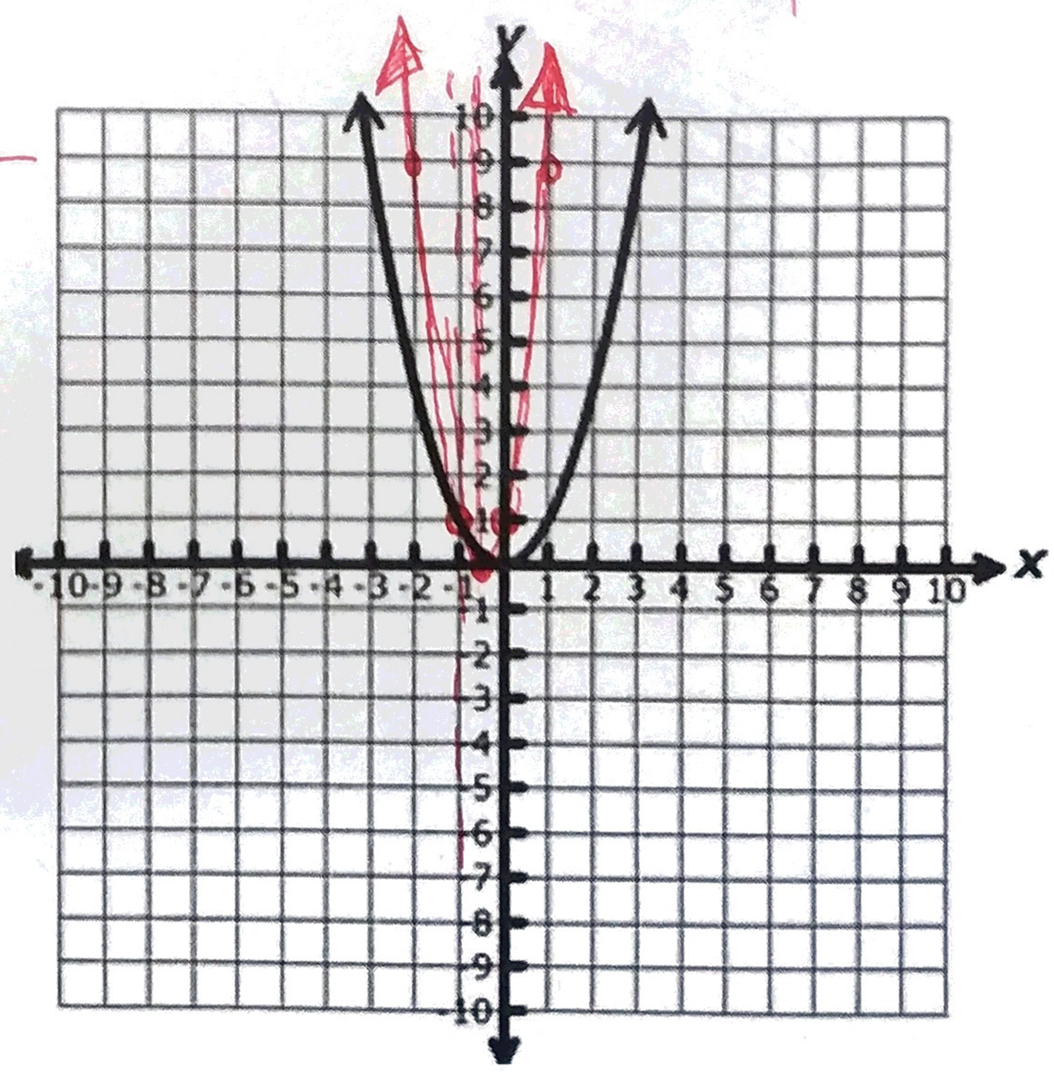
2. $h(x) = (2x + 1)^2$

horizontally compress, left 1

x	y
-1	1
0	1
$-\frac{1}{2}$	0

a.o.s. $x = -\frac{1}{2}$

Vertex $(-\frac{1}{2}, 0)$

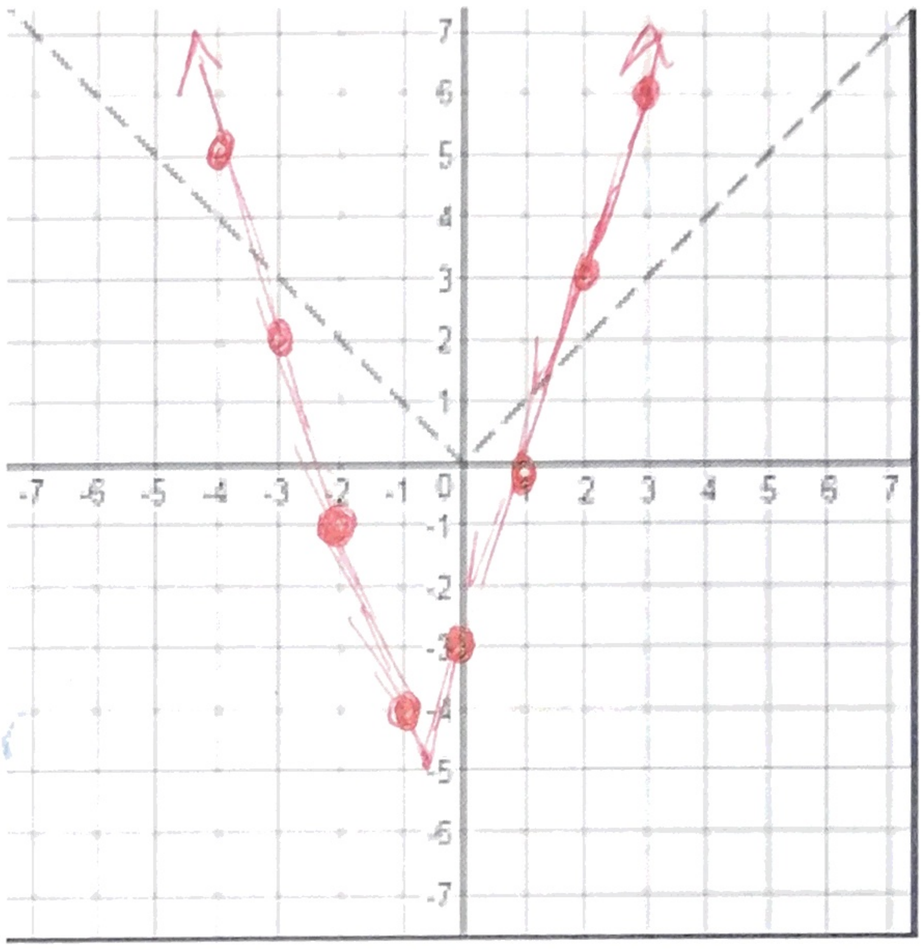


My bad I'm not good at horizontal b/c this is the only time we do it

3. $r(x) = |3x + 2| - 5$

horizontally compressed | left 2 | down 5

x	y
-2	-1
-1	-4
0	-3
1	0



Vertex

(-0.66666644, -4.999993)

(-2/3, -5)

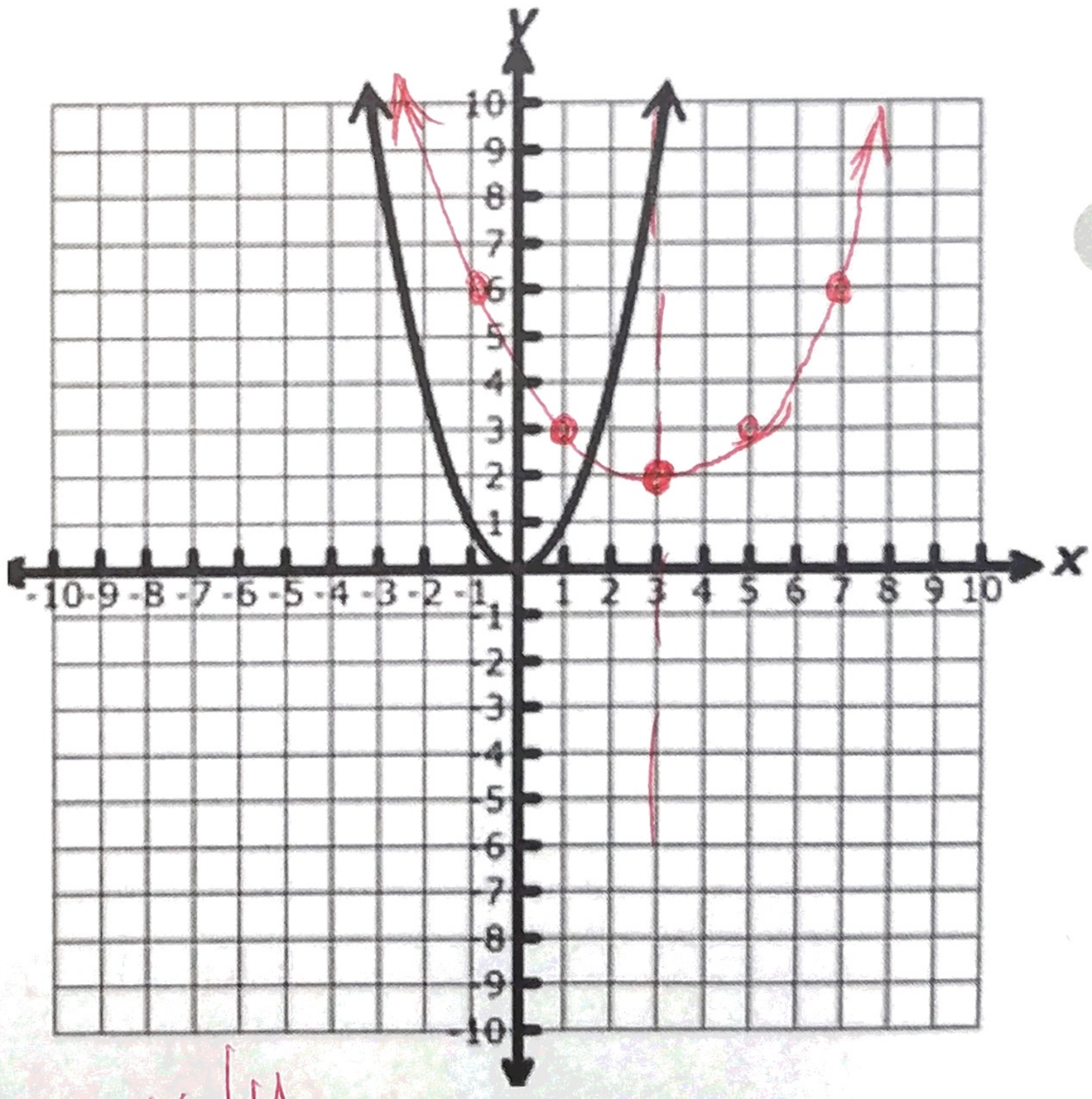
used the calculator

4. ~~$g(x) = (\frac{1}{4}x - 3)^2 + 2$~~

Changed Problem so it's vertical

$g(x) \frac{1}{4}(x-3)^2 + 2$

Vertically compressed | right 3 | up 2



Vertex (3, 2)

a.o.s. x=3

x	y
5	3
7	6