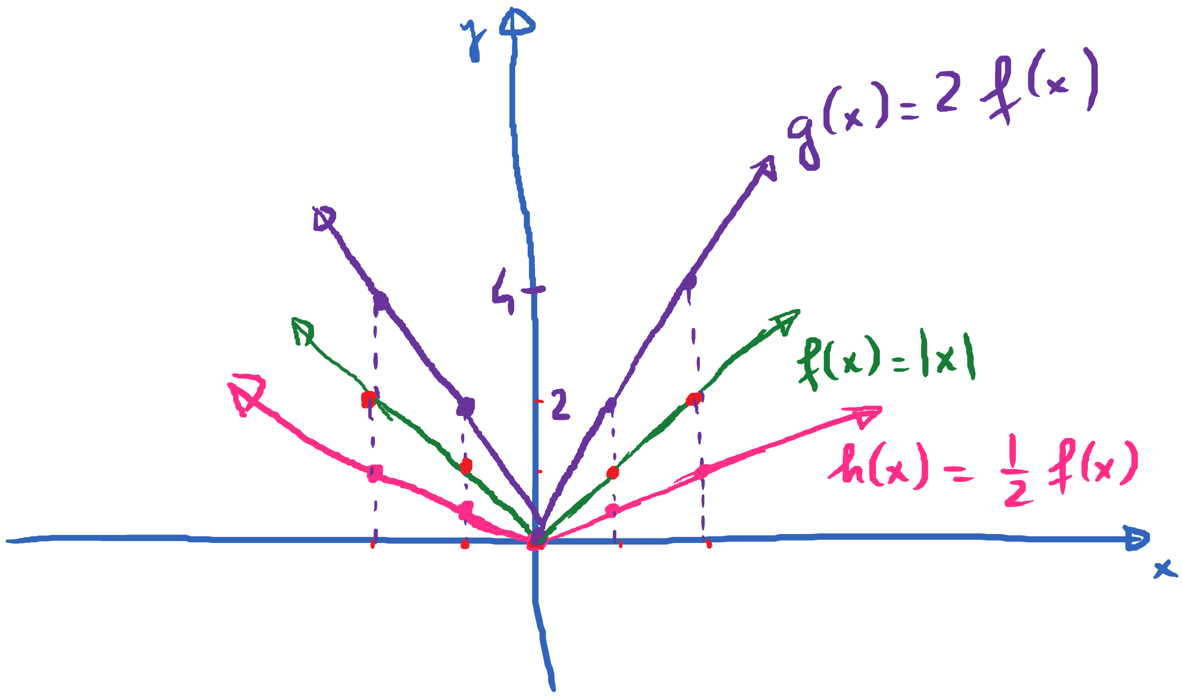
Tuesday, October 10, 2017 9:50 AM

Vertical Stretching and Vertical Shrinking of Graphs.



x	$f(x) = \|x\|$
-2	2
-1	1
0	0
1	1
2	2

$g(x) = 2f(x) = 2|x|$

x	$g(x) = 2f(x)$
-2	4
-1	2
0	0
1	2
2	4

$h(x) = \frac{1}{2} f(x) = \frac{1}{2}|x|$

x	$h(x) = \frac{1}{2} f(x)$
-2	1
-1	1/2
0	0
1	1/2
2	1

$y = f(x)$ is a function, c is a positive number.

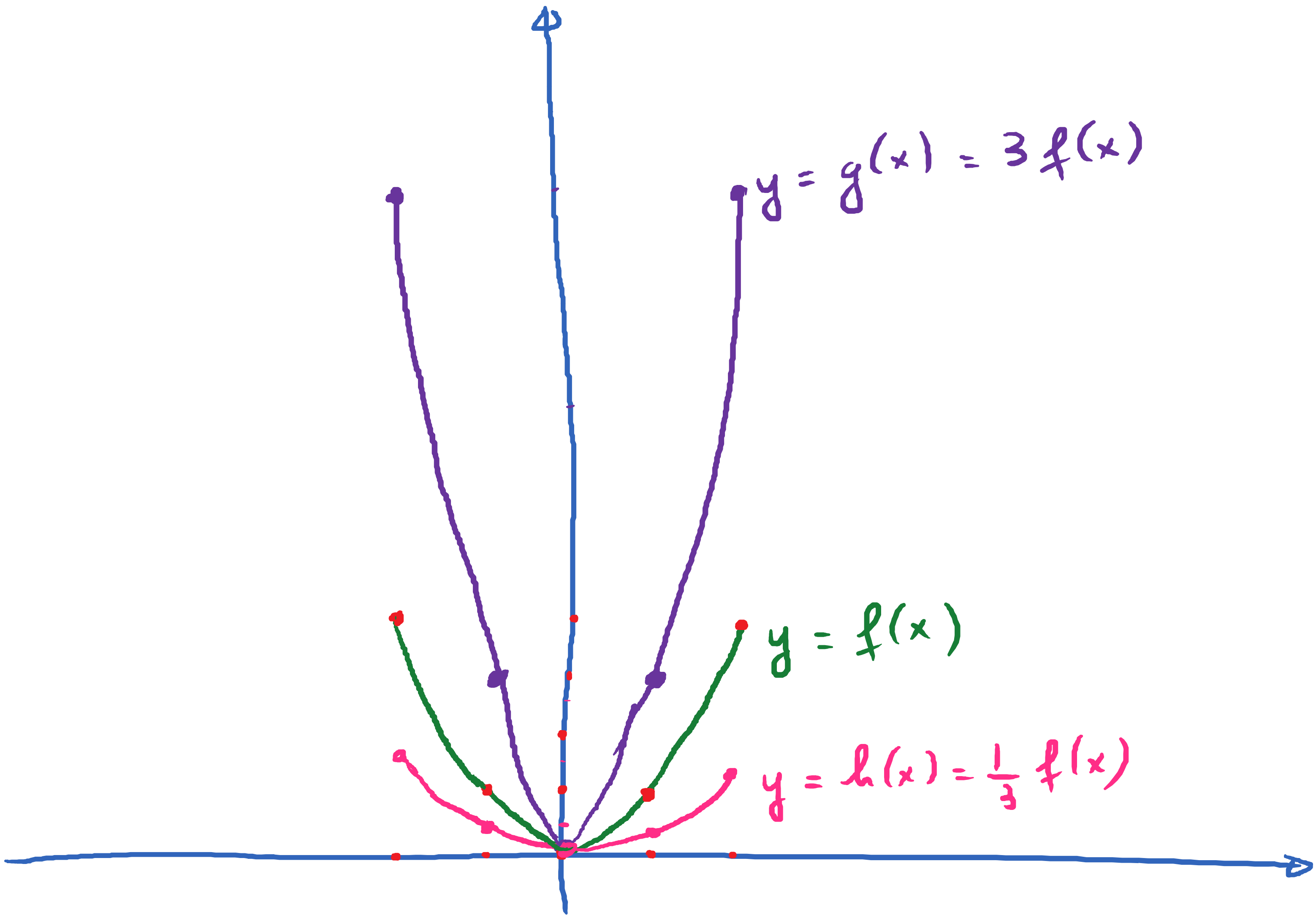
If $\boxed{c > 1}$, the graph of $y = c\,f(x)$ is obtained from the graph of $y = f(x)$ by **vertically stretching** (Multiply the graph of $y = f(x)$ by a factor of c. Multiply each y-coordinate of every point on the old graph by c)

If $\boxed{c < 1}$, the graph of $y = c\,f(x)$ is the graph of $y = f(x)$ **vertically shrunk** by multiplying each y-coordinate by c.

E.g. $f(x) = x^2$. Graph this function, show 5 key points on the graph.

(a) Use this graph to obtain graph of $g(x) = 3x^2$

(b) ______ $h(x) = \frac{1}{3}x^2$.

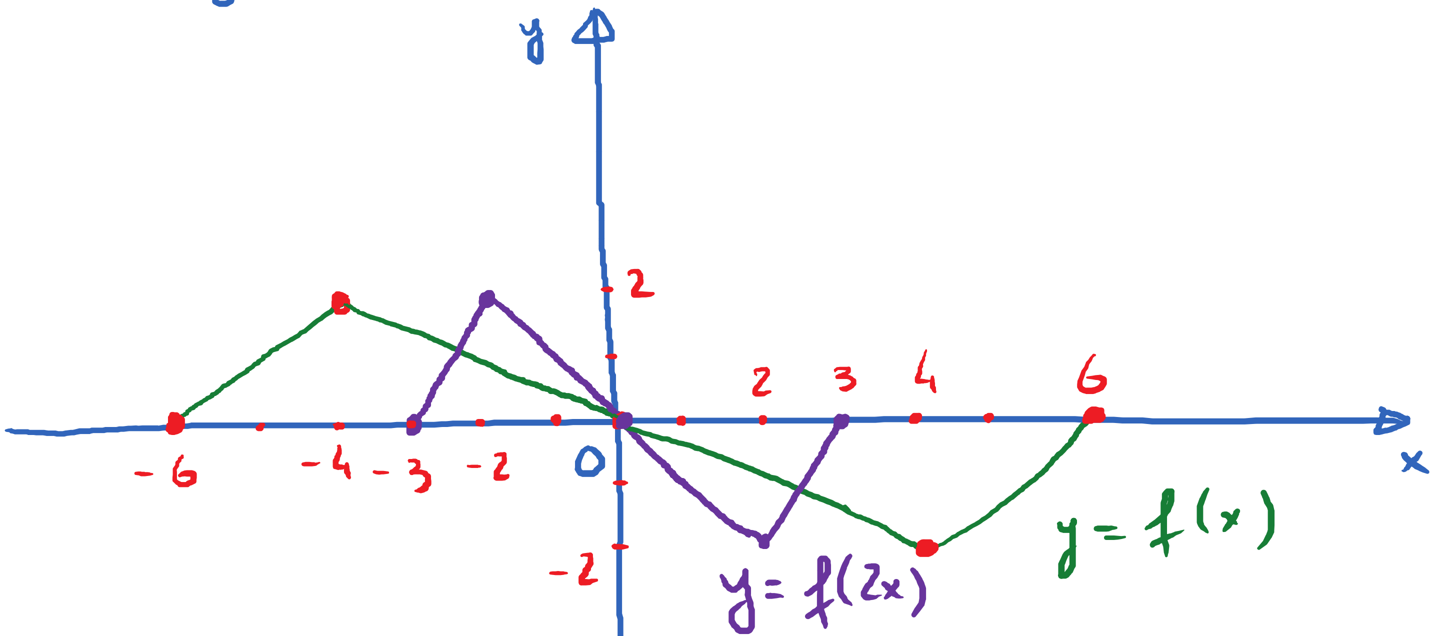


x	$y = f(x) = x^2$
0	0
-2	4
-1	1
1	1
2	4

x	$g(x) = 3f(x)$
0	0
-2	12
-1	3
1	3
2	12

x	$h(x) = \frac{1}{3}f(x)$
0	0
-2	4/3
-1	1/3
1	1/3
2	4/3

Horizontal Stretching and Shrinking



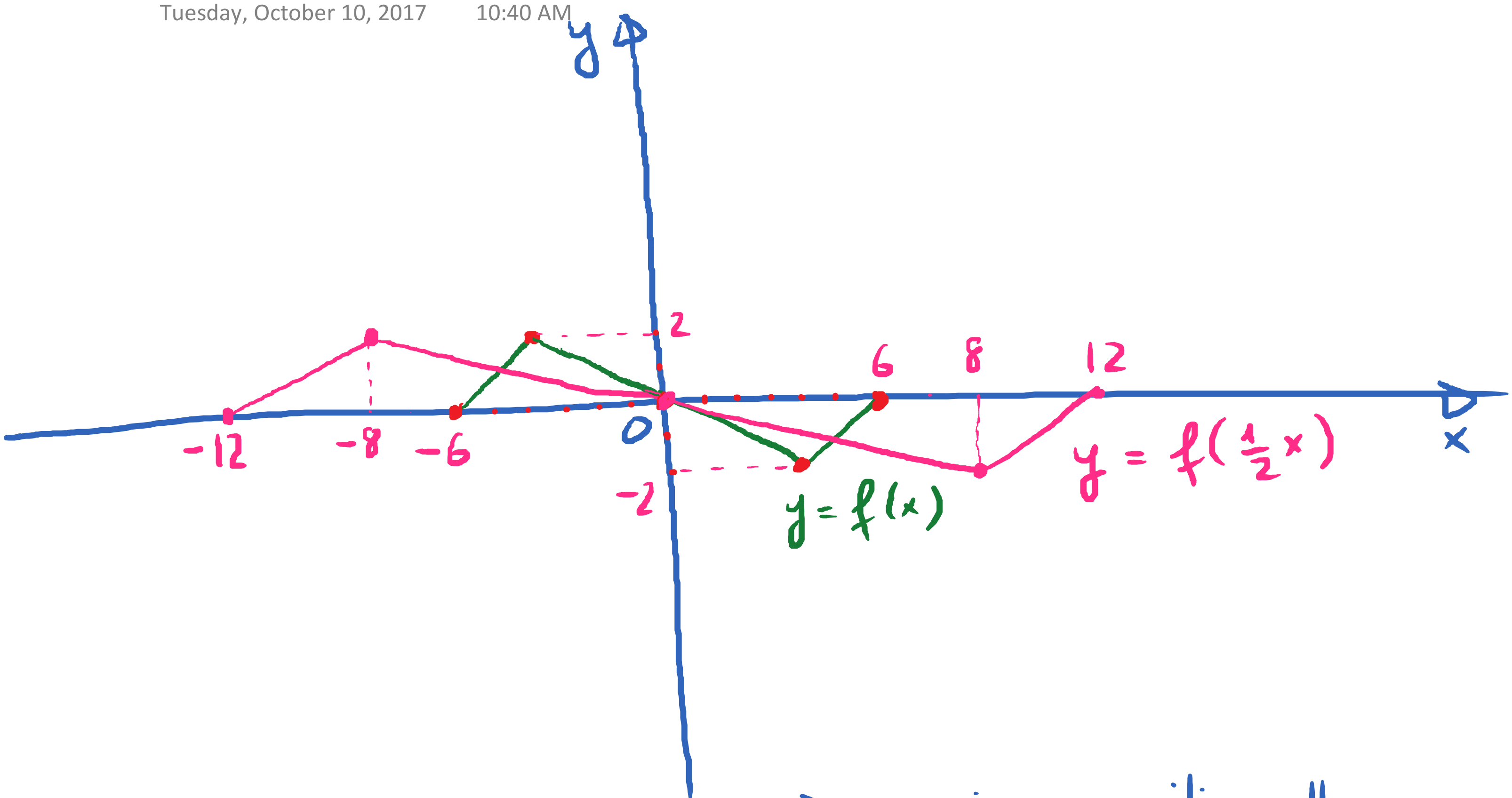
x	$f(x)$
-6	0
-4	2
4	-2
6	0
0	0

$$y = f(2x)$$

x	$y = f(2x)$
-3	0
-2	2
2	-2
3	0
0	0

$$y = f\left(\tfrac{1}{2}x\right)$$

x	$y = f(\frac{1}{2}x)$
-12	0
-8	2
8	-2
12	0
0	0



$y = f(x)$ is a function. $c > 0$ is a positive #.

If $c > 1$, the graph of $y = f(cx)$ is the graph of $y = f(x)$ horizontally shrunk by dividing each x-coordinates of the points on the old graph by c.

If $c < 1$, the graph of $y = f(cx)$ is the graph of $y = f(x)$ horizontally stretch by multiplying each x-coordinates of the old graph by $\frac{1}{c}$.

Ex. Explain the moves (transformations) to obtain the graph of the given function from the basic functions.

Function	Basic function	Moves
$g(x) = -\frac{1}{2}(x+1)^2 - 3$	$f(x) = x^2$	Shift left 1 unit Shrink vertically by a factor $\frac{1}{2}$ Flip across x-axis Shift down 3 units
$h(x) = \frac{1}{2}\left(3\sqrt{x+4}\right) + 3$ $= \frac{3}{2}\sqrt{x+4} + 3$	$\boxed{f(x) = \sqrt{x}}$	Shift left 4 units Vertically stretch by a factor $\frac{3}{2}$. Move up 3 units

Did HW # 13