2.5 - Transformations of Graphs of Functions

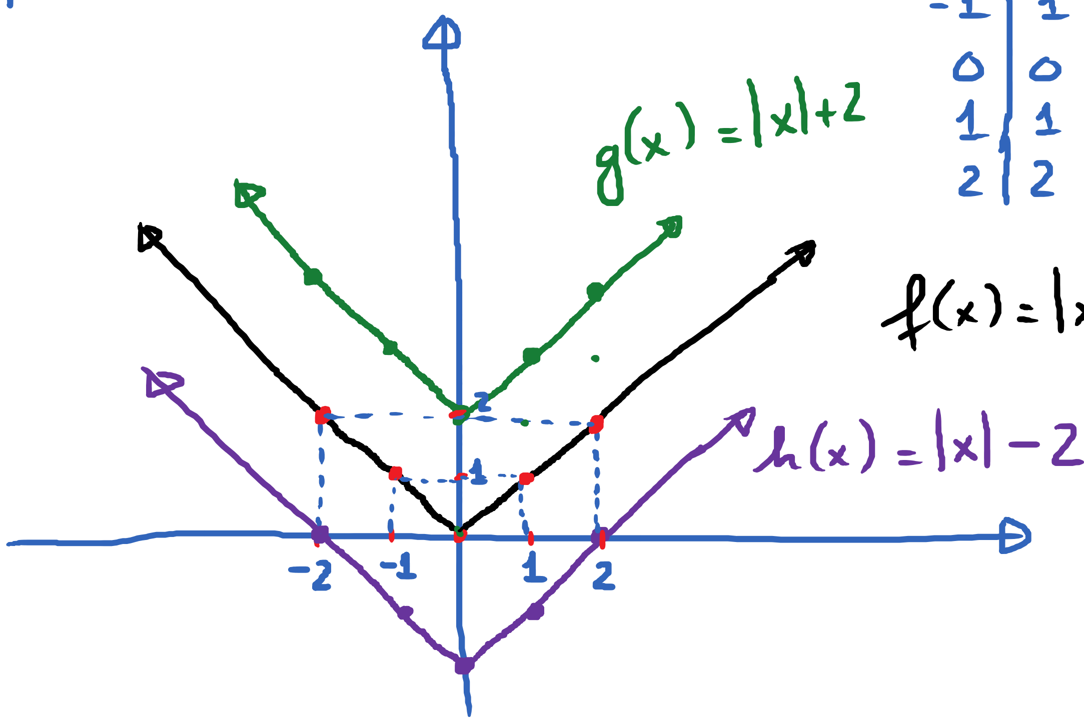
Thursday, October 5, 2017 10:08 AM

Goals:
1. Vertical Shifts
2. Horizontal Shifts
3. Reflections: about x-axis; about y-axis
4. Vertical Stretch
5. Horizontal Stretch

Vertical Shift:

$$f(x) = |x|$$

x	$f(x)$
-2	2
-1	1
0	0
1	1
2	2



Use the graph of $f(x) = |x|$ to obtain the graph of $g(x) = |x| + 2$.

The graph of $g(x)$ is obtained from the graph of $f(x)$ by shifting the graph of $f(x)$ vertically up by 2 units. (For every point (x, y) on the graph of f, we keep x and add 2 to y.

In general, f is any function, $c > 0$ is a positive number.

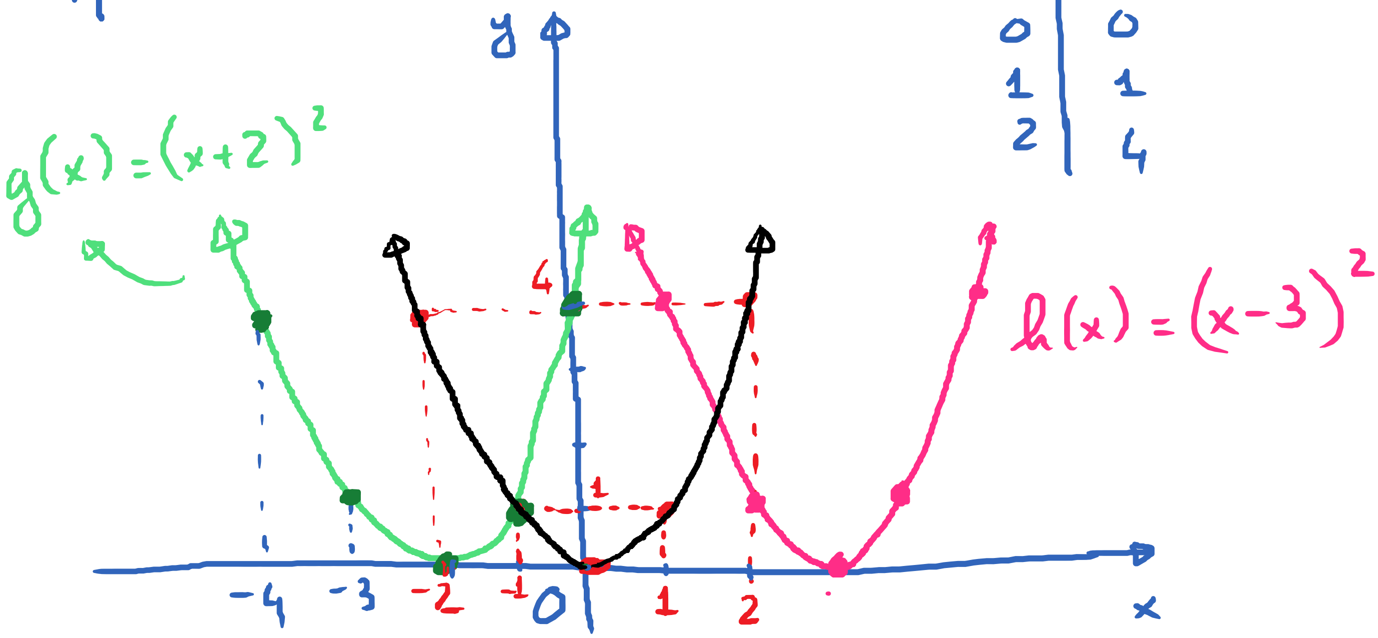
The graph of $g(x) = f(x) + c$ is the graph of $y = f(x)$ shifted c units vertically upward.

The graph $g(x) = f(x) - c$ is the graph of $y = f(x)$ shifted c units vertically downward

2) Horizontal Shift.

$f(x) = x^2$

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



Use the graph of $f(x) = x^2$ to obtain the graph of $g(x) = (x+2)^2$

$h(x) = (x-3)^2$

In general, f is any function and $c > 0$ is a positive number.

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

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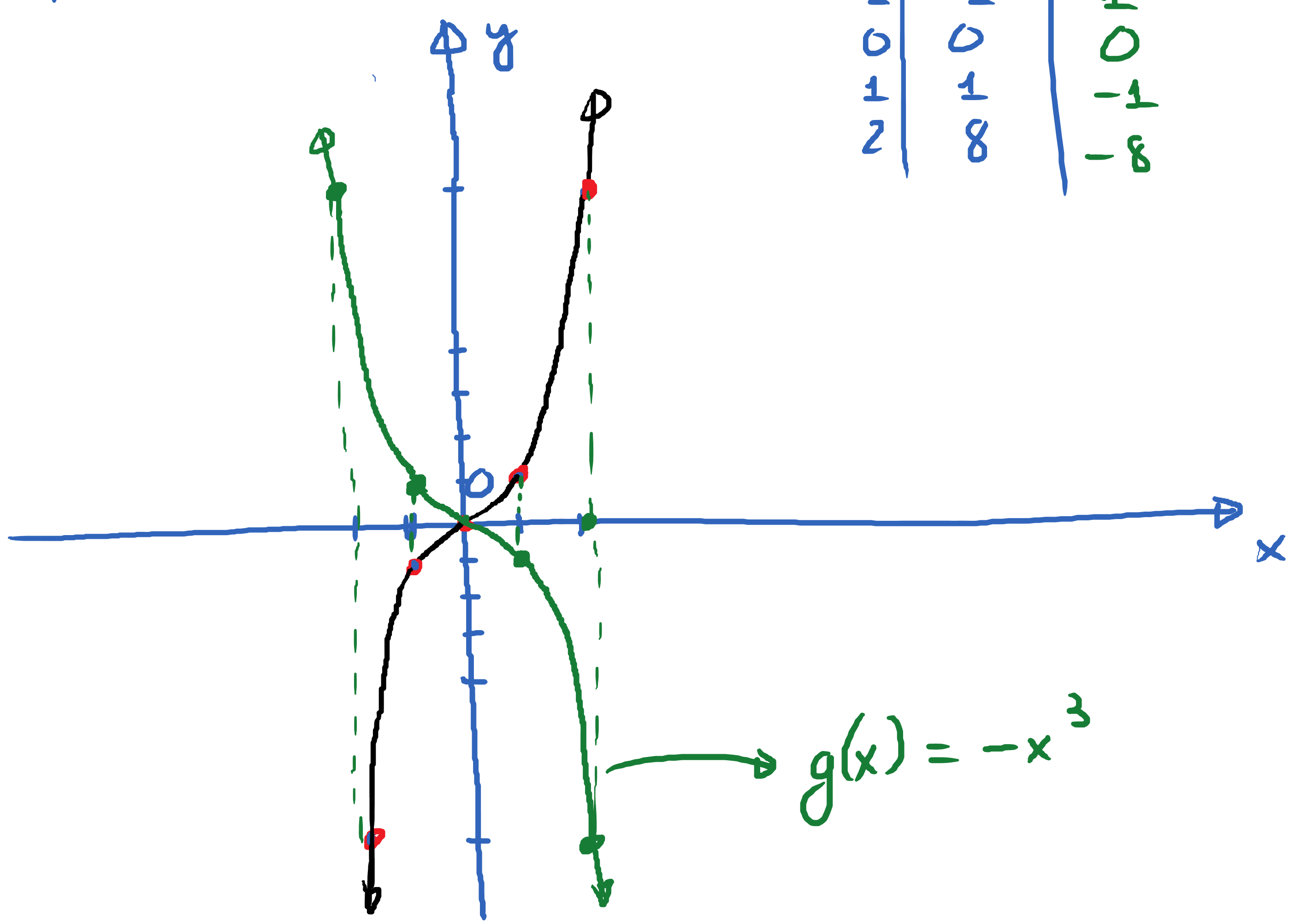
The graph of $g(x) = f(x-c)$ is the graph of $y = f(x)$ shifted to the right c units.

③ Reflections of graph.

$f(x) = x^3$

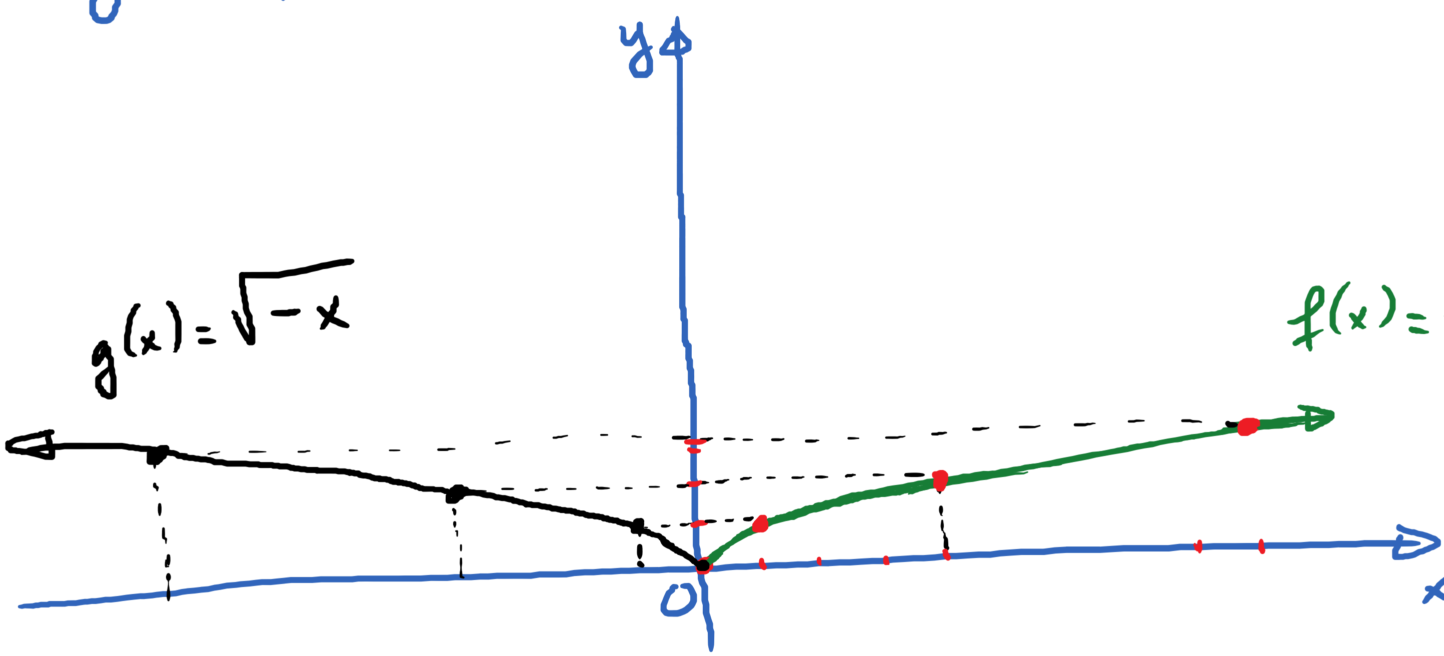
x	$f(x)$	$g(x)$
-2	-8	8
-1	-1	1
0	0	0
1	1	-1
2	8	-8



$g(x) = -x^3$

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

E.g. $f(x) = \sqrt{x}$

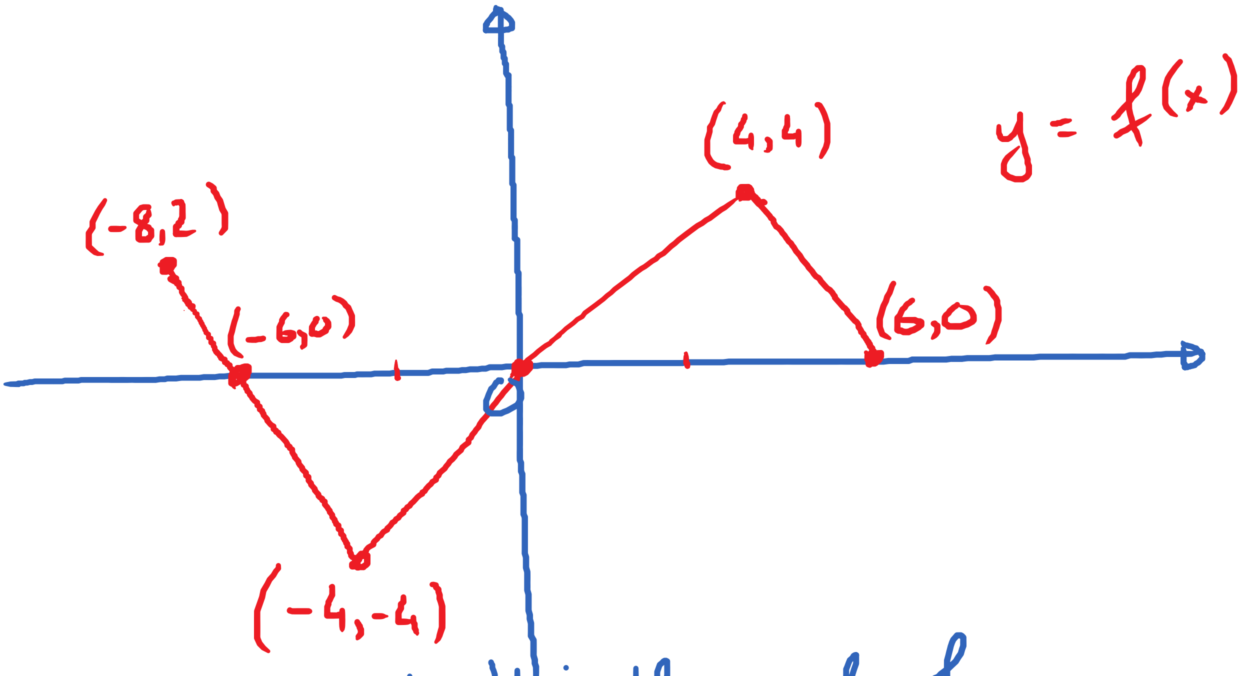


x	f(x)
0	0
1	1
4	2
9	3

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

x	g(x)
0	0
-1	1
-4	2
-9	3

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



Use this graph to obtain the graph of

(a) $g(x) = -f(x-1)$ Shift to right 1 unit and flip across x-axis.

(b) $h(x) = f(x+1) + 2$ Shift to left 1 unit and up 2 units

(c) $m(x) = -f(x+1) - 1$ Shift to left 1 unit, reflect across x-axis, shift down 1 unit