Section 2.5 - Part 2

Tuesday, October 1, 2019 9:50 AM

Recall: Given $y = f(x)$ and c is a positive number

$y = f(x) + c$:	up by c units	Vertical Shift
$y = f(x) - c$:	down by c units	
$y = f(x + c)$:	left by c units	Horizontal Shift
$y = f(x - c)$:	right by c units	

Obj 1: Vertical Stretching and Shrinking.

Vertical Stretching and Shrinking of Graphs

Given a function $y = f(x)$ and a positive number c.

Stretching: $c > 1$

The graph of

$$y = c \cdot f(x)$$

is the graph of

$$y = f(x)$$

vertically stretched by multiplying each of its y-coordinate by c

Shrinking: $0 < c < 1$

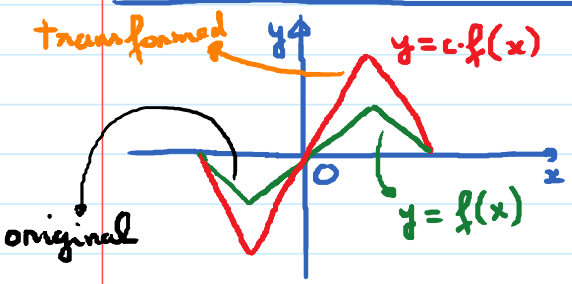
The graph of

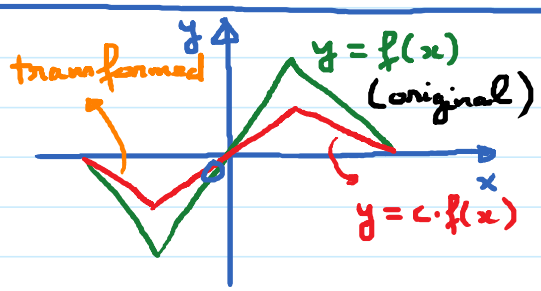
$$y = c \cdot f(x)$$

is the graph of

$$y = f(x)$$

vertically shrunk by multiplying each of its y-coordinate by c





E.g. Given $y = f(x) = x^2$ $\quad c = 2 > 1$

(a) What is the formula for $y = 2f(x)$?

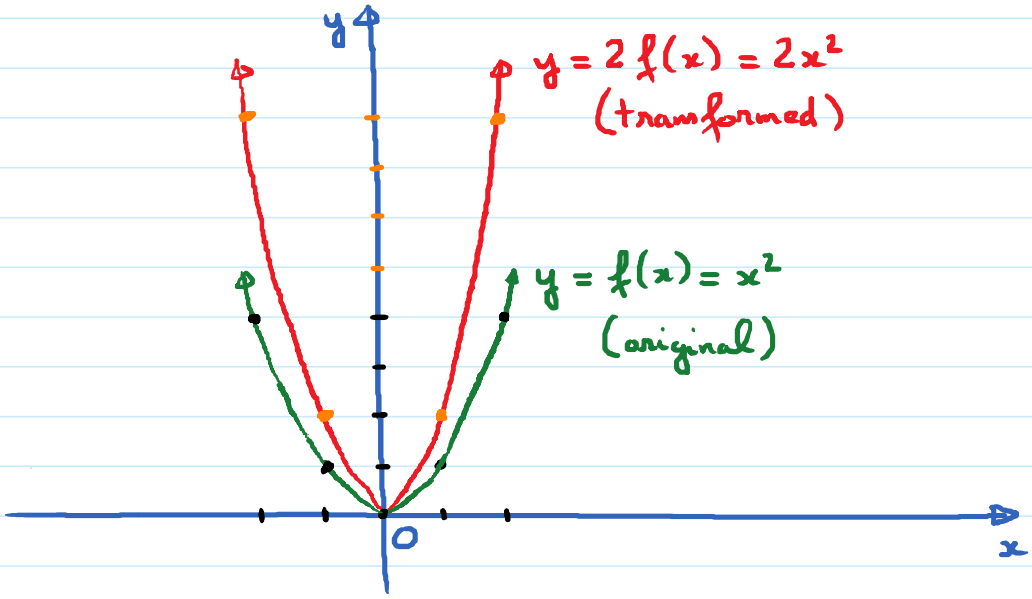
$$y = 2x^2$$

(b) Graph $y = f(x)$ and $y = 2f(x)$ (5 key points).

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

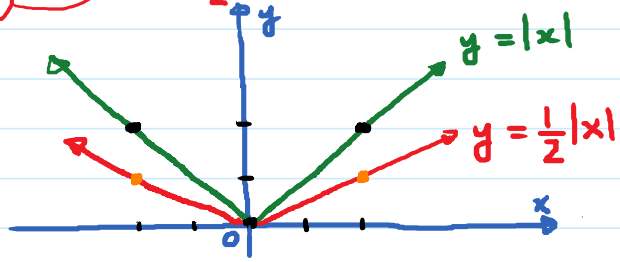
x	$y = 2f(x) = 2x^2$
-2	$8 \to (-2, 8)$
-1	$2 \to (-1, 2)$
0	$0 \to (0, 0)$
1	$2 \to (1, 2)$
2	$8 \to (2, 8)$

Each y-coordinate is multiplied by 2



E.x. Graph $y = |x|$ (3 key points). Use transformation to graph $y = \frac{1}{2}|x|$. $\quad c = \frac{1}{2} < 1$

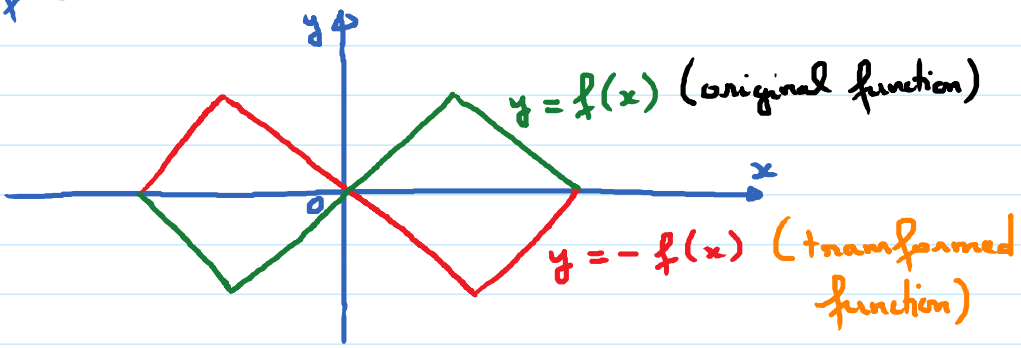
x	$y = \lvert x \rvert$
-2	$2 \to (-2, 2)$
0	$0 \to (0, 0)$
2	$2 \to (2, 2)$



Obj 2: Reflections of Graphs

Reflection about the x-axis.

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



E.g. Given $y = f(x) = x^2$.

(a) What is the formula of $y = -f(x)$?

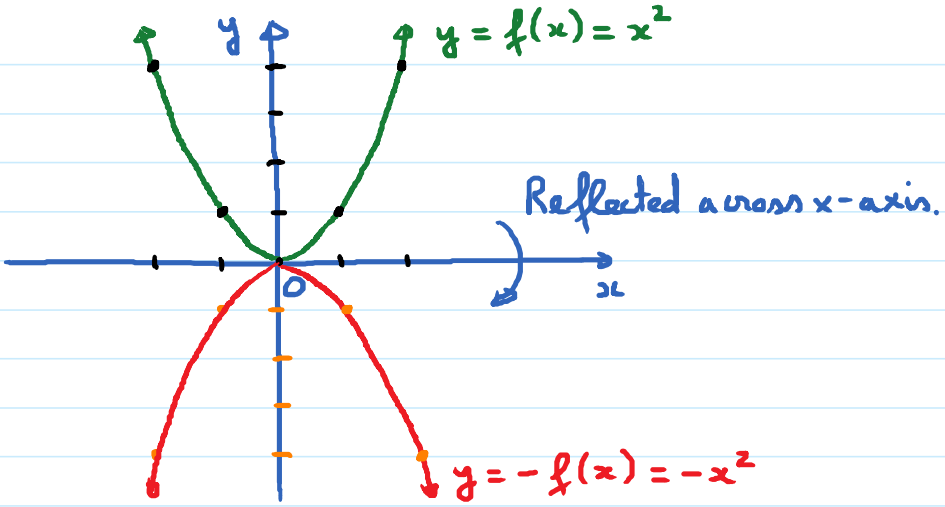
$$y = -x^2$$

(b) Graph $y = x^2$ and $y = -x^2$ (5 key points)

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

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

The sign of each y-coordinate changes



Obj 3: Sequences of Transformations

Given $y = f(x) = x^2$.

(a) What is the formula of $y = 2 \cdot f(x+3) - 1$?

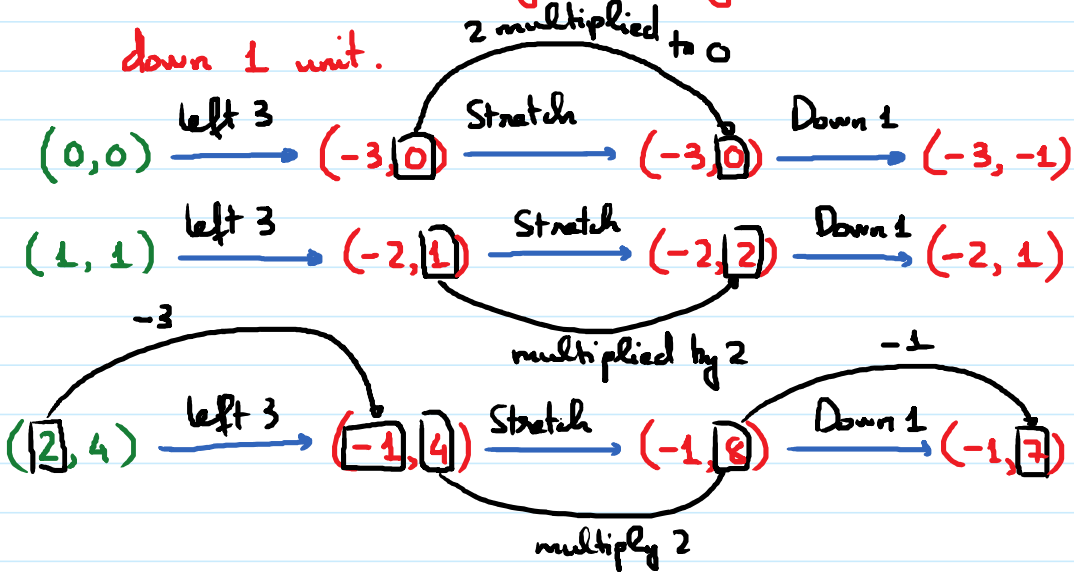
(b) Use transformations to graph the function in part (a).

Sol: (a) $y = 2 \cdot \boxed{f(x+3)} - 1$ $\quad (x+3)^2$

$$y = 2(x+3)^2 - 1$$

(b) Sequence of transformations:

left 3 units, Vertically stretch by a factor of 2, down 1 unit.



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