7.2. Graphs Transformations

Thursday, September 27, 2018 1:45 PM

Objectives: (1) Vertical Translation and Horizontal Translation

(2) Reflections

(3) Vertical Stretching and Shrinking
Horizontal Stretching and Shrinking

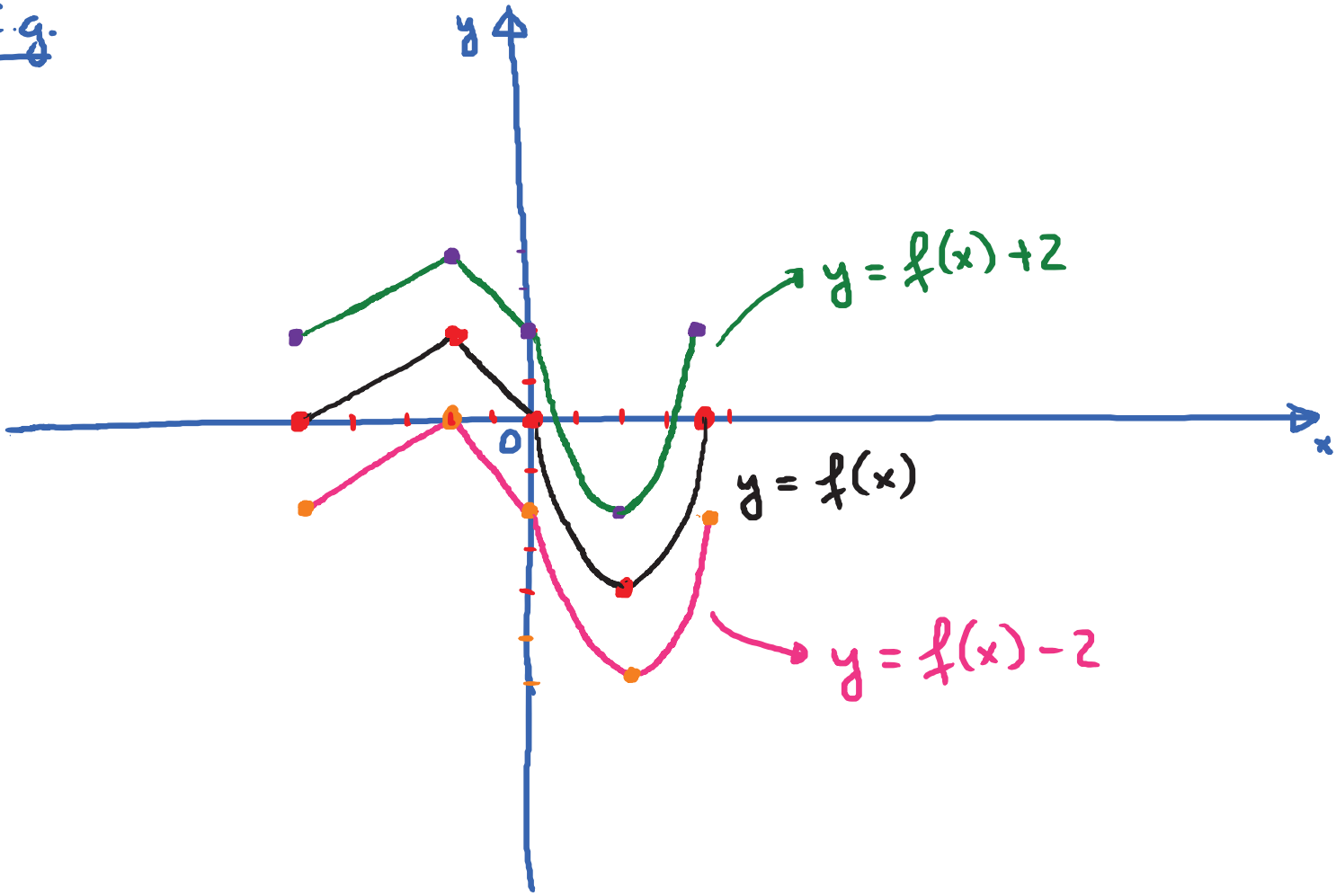
(1) Vertical Translation.

For $b > 0$:

* The graph of $y = f(x) + b$ is the graph of $y = f(x)$ shifted up b units

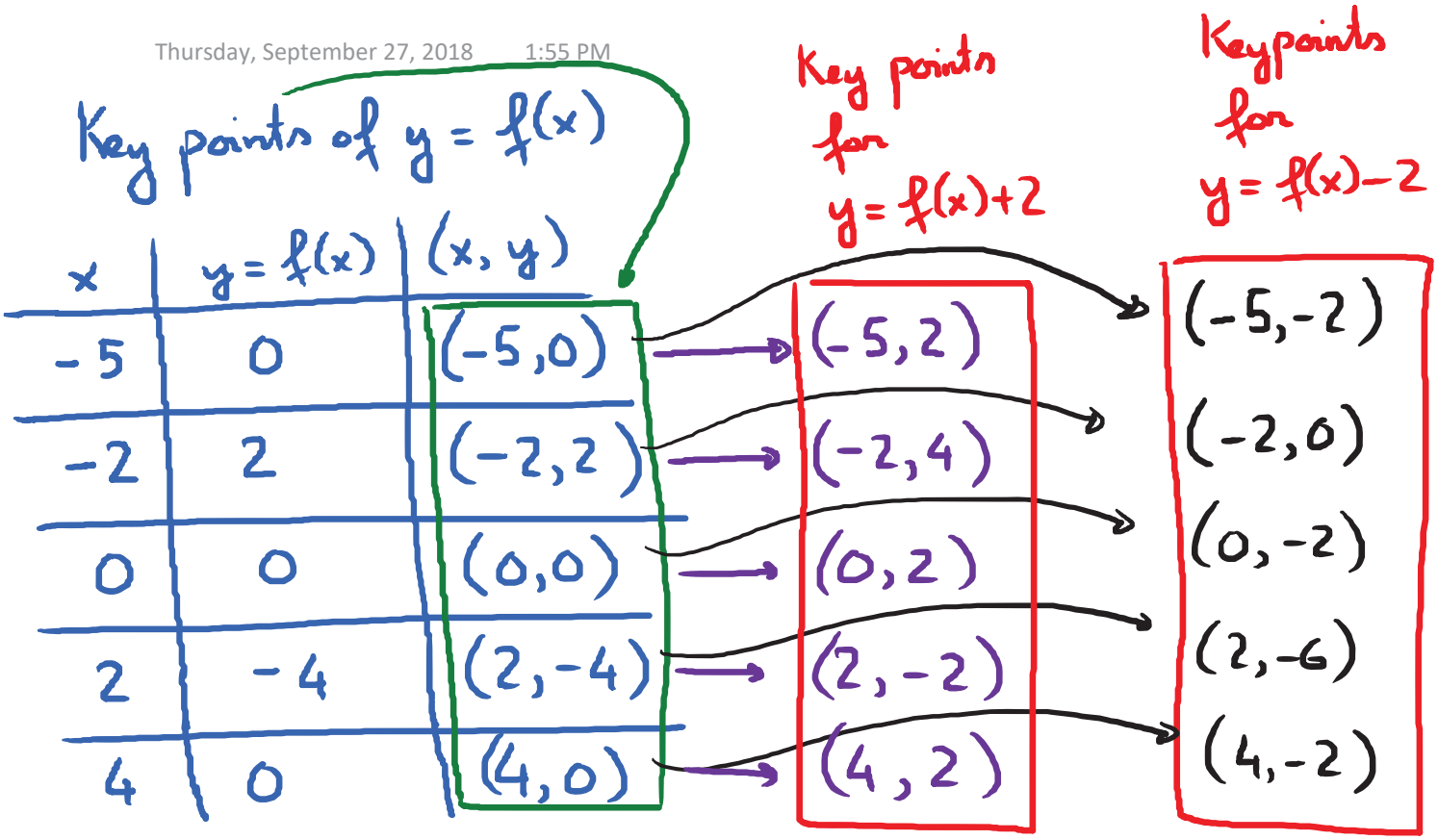
* The graph of $y = f(x) - b$ is the graph of $y = f(x)$ shifted down b units

E.g.



Use this given graph to obtain the graph of

$y = f(x) + 2$ and $y = f(x) - 2$



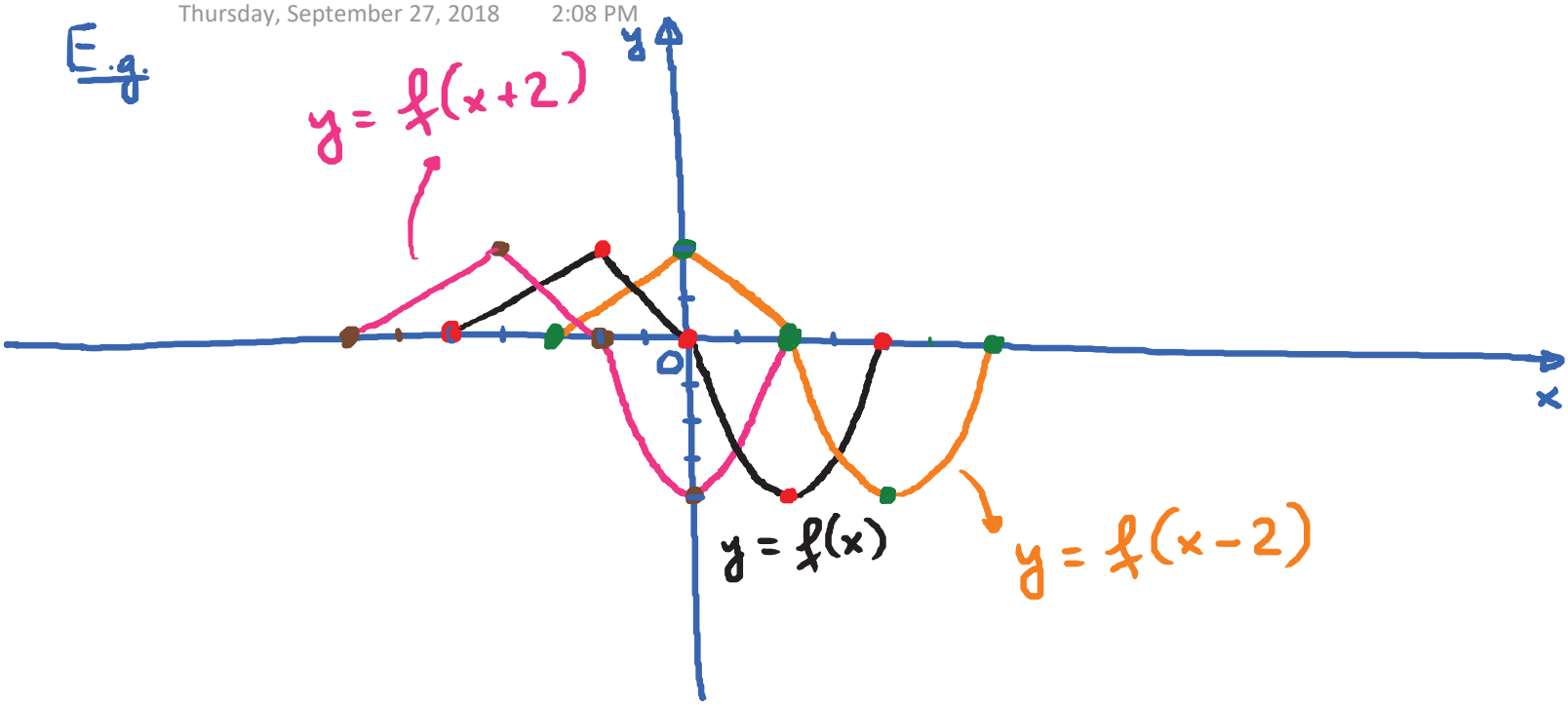
Horizontal Translation

For $d > 0$:

* The graph of $y = f(x-d)$ is the graph of $y = f(x)$ shifted to the right d units

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

E.g.



Use this graph to obtain the graph of:

$y = f(x-2)$ and $y = f(x+2)$

Key points of $y = f(x)$

x	y = f(x)	(x, y)
-5	0	(-5, 0)
-2	2	(-2, 2)
0	0	(0, 0)
2	-4	(2, -4)
4	0	(4, 0)

Key points of $y = f(x-2)$

(-3, 0)
(0, 2)
(2, 0)
(4, -4)
(6, 0)

Key points of $y = f(x+2)$

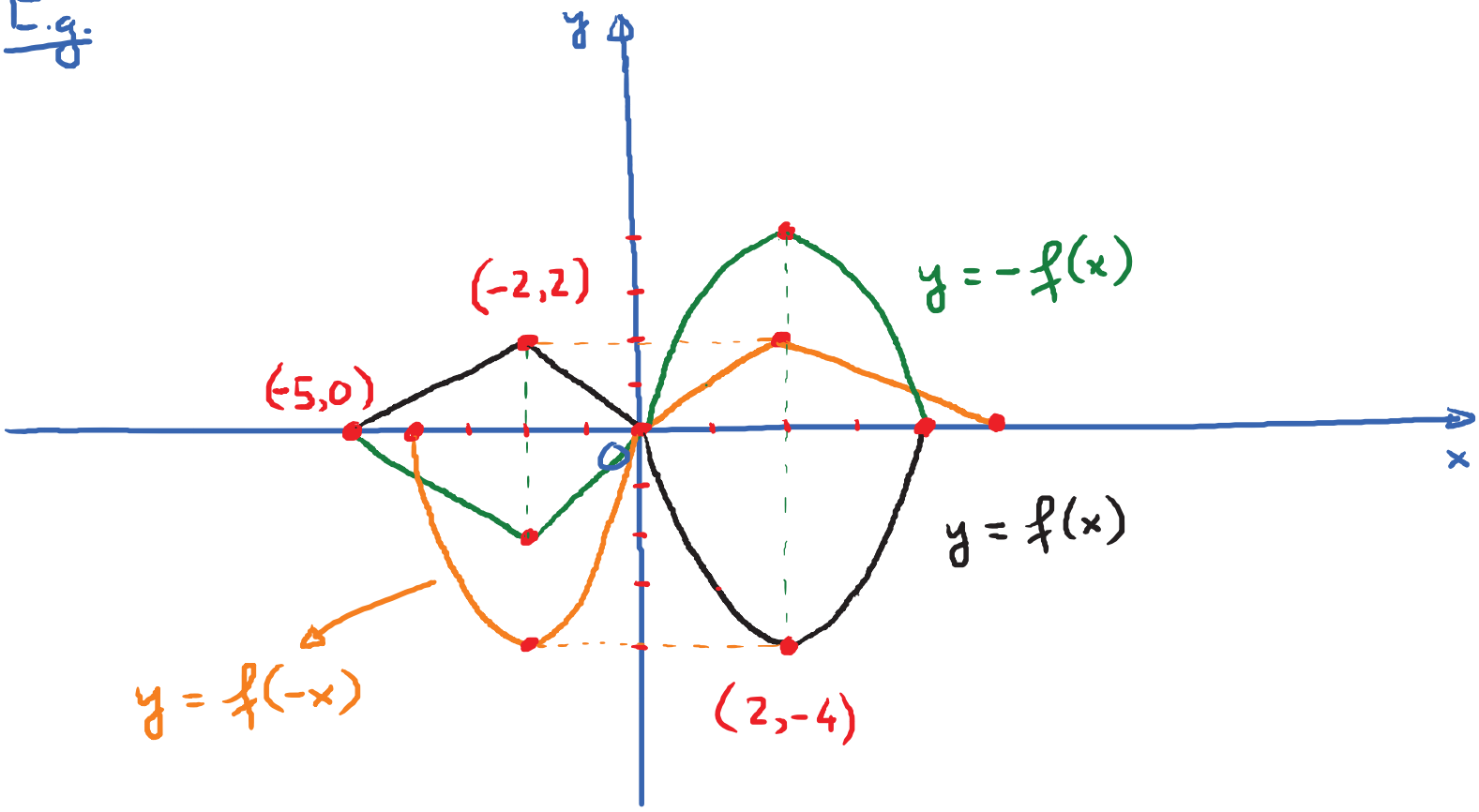
(-7, 0)
(-4, 2)
(-2, 0)
(0, -4)
(2, 0)

(2) Reflections

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

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

E.g.



(3) Vertical Stretching and Shrinking.

For $a > 0$

The graph of $y = a f(x)$ can be obtained from the graph of $y = f(x)$ by:

* Stretching Vertically if $a > 1$.
* Shrinking Vertically if $a < 1$.
* If $a < 0$, the graph is also reflected across the x-axis.

E.g. Use the graph of $y = f(x)$ to obtain the graph of

$y = \boxed{2} f(x)$; $y = \boxed{\frac{1}{2}} f(x)$; $y = \left(-\frac{1}{2}\right) f(x)$;

$\boxed{2}$: $a > 1$ $\quad$ $\boxed{\frac{1}{2}}$: $a < 1$ $\quad$ $-\frac{1}{2}$: $a < 0$

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

$a < 0$