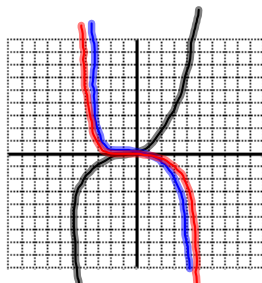
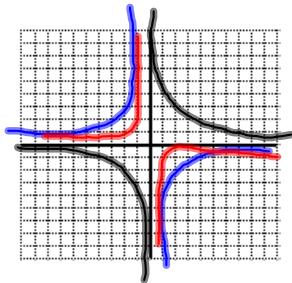
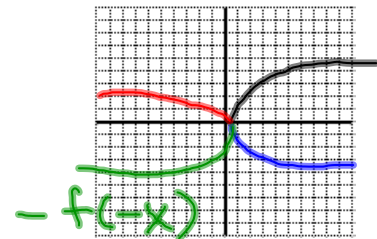
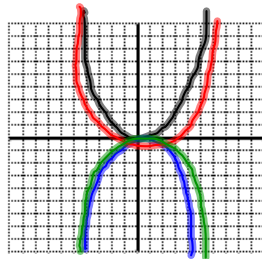
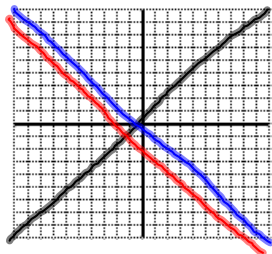


Transformations Investigation

	$-f(x)$	$f(-x)$
$f(x) = x$	$-x$	$-x$
$f(x) = x^2$	$-x^2$	$(-x)^2 \rightarrow x^2$
$f(x) = \sqrt{x}$	$-\sqrt{x}$	$\sqrt{-x}$
$f(x) = \frac{1}{x}$	$-\frac{1}{x}$	$\frac{1}{(-x)}$
$f(x) = x^3$	$-x^3$	$(-x)^3 \rightarrow -x^3$



$f(-x)$
 Reflect in y
 changes in x

$-f(x)$
 Reflect in x
 changes to y

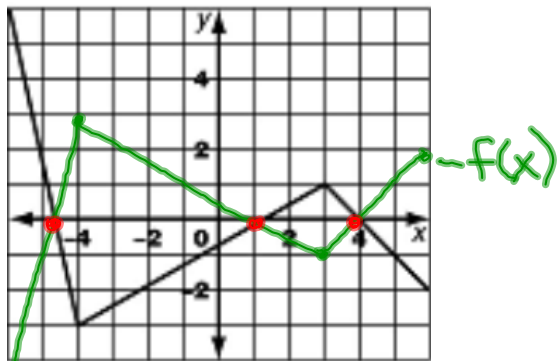
Horizontal & vertical translations

Translation	Mathematical Form	Effect on the Graph (x, y)
Vertical	$y = f(x) + k$	Shift up k $(x, y+k)$
	$y = f(x) - k$	Shift Down k $(x, y-k)$
Horizontal	$y = f(x+h)$	Shift Left h $(x-h, y)$
	$y = f(x-h)$	Shift Right h $(x+h, y)$

Reflections

Stretch	Mathematical Form	Effect on the Graph
Vertical	$y = -f(x)$	Reflect in x-axis $(x, -y)$
Horizontal	$y = f(-x)$	in y-axis $(-x, y)$

$y = -f(-x)$ Reflect in x-axis and y-axis $(-x, -y)$



$y = f(x)$

$y = -f(x)$

X	Y
-6	6
-4	-3
3	1
6	-2

X	Y
-6	-6
-4	3
3	-1
6	2

$(x, y) \rightarrow (x, -y)$

INVARIANT POINTS

- do not change under transformation

This is a reflection in x-axis. \therefore points on x-axis are INVARIANT.

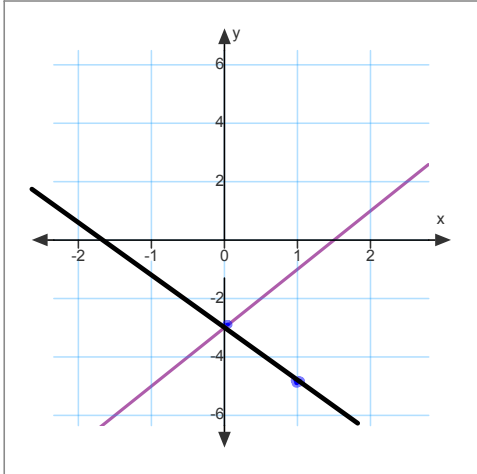
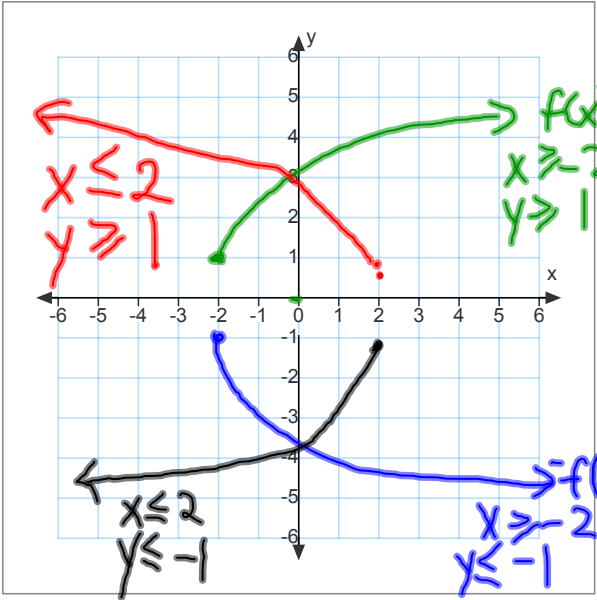
$y = 2x - 3$

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

$$= -2x - 3$$

Invariant? $y = -3$
(on y-axis)

Reflection in y-axis

$f(x) = \sqrt{x+2} + 1$
Left 2 ↑ up 1.

$$-f(x) = -(\sqrt{x+2} + 1)$$

$$= -\sqrt{x+2} - 1$$
 Reflection x

$f(-x)$ Reflect in y-axis
 $\sqrt{-x+2} + 1$
Reflect in y ↑ up 1
 $\sqrt{-(x-2)} + 1$
Right 2

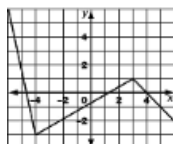
$-f(-x)$
Reflect in x and y
 $= -\sqrt{-(x-2)} - 1$

Invariant Points

	$y=-f(x)$	$y=f(-x)$
Points (x,y)	$(x,-y)$	$(-x,y)$
Intercept	x-intercept	y-intercept
Reflection in..	x-axis	y-axis
Invariant Points	Point on x-axis	Point on y-axis

p. 203 #1, 2, 5, 7.

Assign due Tomorrow.



Sketch a function

Apply the following transformations to your function

- $-f(x)$
- $f(x) + 3$
- $f(x - 2)$
- $f(x + 5) - 1$
- $f(-x) + 2$