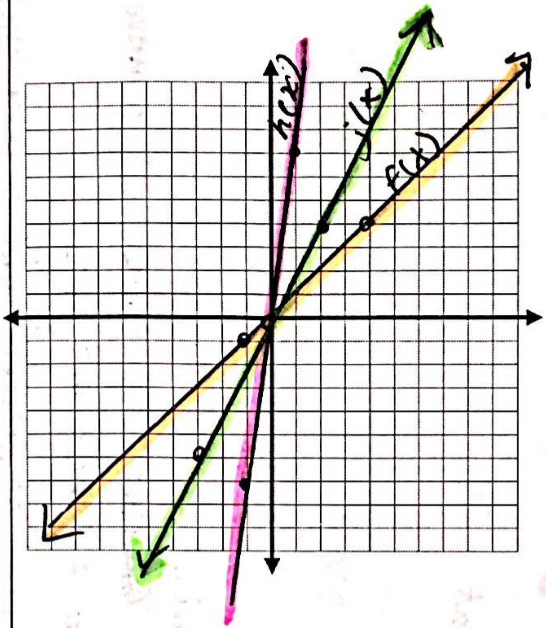
Algebra 1: Unit 6, Lesson 8: Activity/Notes

For each set of functions, graph by using a table. Graph the parent function, f(x) in black, g(x) in red, h(x) in blue, and j(x) in green.
Determine the big idea that the graphs are demonstrating.

Set 1



$f(x) = x$

parent function

x	y
0	0
-1	-1
4	4

$g(x) = 3x$

x	y
0	
-3	
2	

$h(x) = 7x$

$h(0) = 7(0)$
$h(-1) = 7(-1)$
$h(1) = 7(1)$

x	y
0	0
-1	-7
1	7

STEEPEST

$j(x) = 2x$

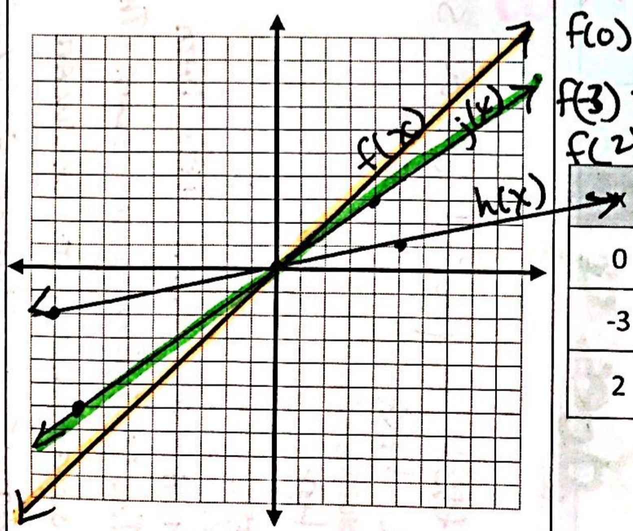
$j(0) = 2(0)$
$j(-3) = 2(-3)$
$j(2) = 2(2)$

x	y
0	0
-3	-6
2	4

STEEPER THAN f(x)

Big idea of Set 1: • Y-INTERCEPT IS STILL 0 (origin)
BIGGER COEFFICIENT OF X, STEEPER LINE.

Set 2



$f(x) = x$

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

x	y
0	0
-3	-3
2	2

$g(x) = \frac{1}{2}x$

x	y
0	
-6	
2	

$h(x) = \frac{1}{5}x$

$h(0) = \frac{1}{5}(0)$
$h(-10) = \frac{1}{5}(-10)$
$h(5) = \frac{1}{5}(5)$

x	y
0	0
-10	-2
5	1

FLATTEST*

$j(x) = \frac{3}{4}x$

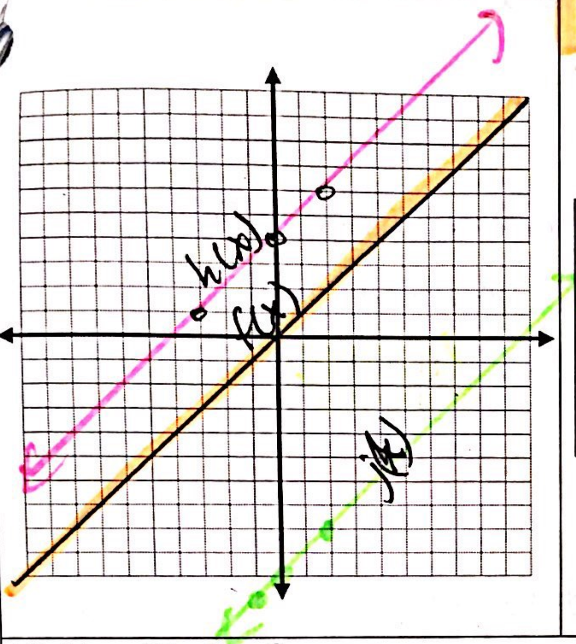
$j(0) = \frac{3}{4}(0)$
$j(-8) = \frac{3}{4}(-8)$
$= -24/4$

x	y
0	0
-8	-6
4	3

$j(4) = \frac{3}{4}(4)$
$= \frac{12}{4} = 3$

Big idea of Set 2: SLOPES LESS THAN ONE ARE FLATTER

x +
set 3



moved up 4 | moved down 10

$f(x)=x$

x	y
0	0
-4	-4
6	6

$g(x)=x-1$

x	y
0	
-3	
2	

$h(x)=x+4$

h(0)=0+4
h(-3)=-3+4
h(2)=2+4

x	y
0	4
-3	1
2	6

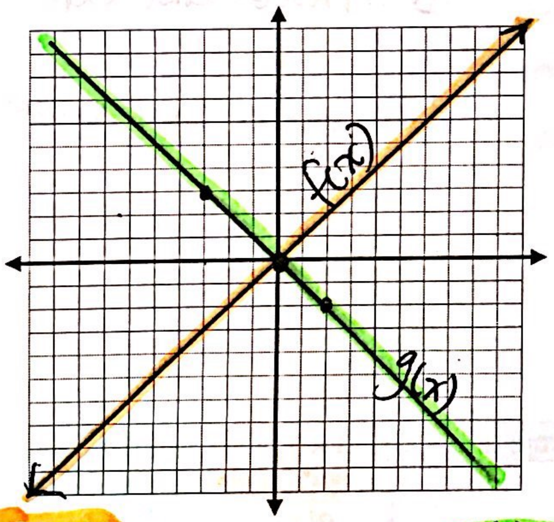
$j(x)=x-10$

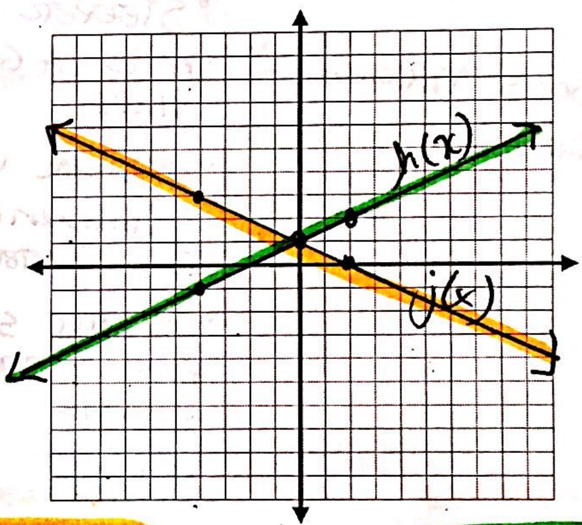
j(0)=0-10
j(-1)=-1-10
j(2)=2-10

x	y
0	-10
-1	-11
2	-8

Big idea of Set 3: CHANGING y-INTERCEPT SHIFTS THE Parent LINE UP AND DOWN THE COORDINATE PLANE

Set 4





$f(x)=x$

x	y
0	0
-8	-8
7	7

$g(x)=-x$

x	y
0	0
-3	-3 ⇒ +3
2	-2

$j(x)=-\frac{1}{2}x+1$

x	y
0	$j(0)=-\frac{1}{2}(0)+1$ 1
-4	$-\frac{1}{2}(-4)+1$ 2+1 3
2	$-\frac{1}{2}(2)+1$ -1+1 0

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

x	y
0	$\frac{1}{2}(0)+1$ 1
-4	$\frac{1}{2}(-4)+1$ -2+1 -1
2	$\frac{1}{2}(2)+1$ 1+1 2

Big idea of Set 4: A NEGATIVE COEFFICIENT FOR x REFLECTS LINE OVER ~~[illegible]~~ y-AXIS.

- Each of these graphing exericises represent a TRANSFORMATION, WHICH IS A CHANGE IN POSITION, SIZE, OR SHAPE OF A GRAPH.

- When a graph is transformed, it's always from the PARENT FUNCTION, WHICH IS THE SIMPLEST FUNCTION WITH THE DEFINING CHARACTERISTICS OF THE FAMILY.

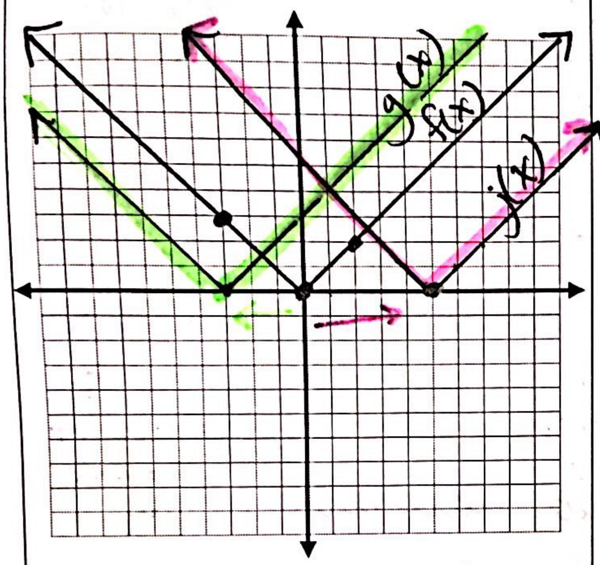
  What that means, is every line, (for example) starts off looking like $y = x$. Based on what is added, subtracted, or multiplied from this function, the line will "shift" around the coordinate plane.

Parent Function	Linear functions transformations $g(x) = mx + b$: m	Linear functions transformations $g(x) = mx + b$: $\boxed{b}$
$f(x) = x$ • SLOPE: 1 • GOES THROUGH ORIGIN	• STEEPER WHEN m IS A GREATER VALUE. • SMALLER VALUE (between 0 + 1) IS A FLATTER SLOPE • NEGATIVE SLOPE FLIPS PARENT OVER y-AXIS	b^+: moves LINE UP b^-: moves LINE DOWN

Ex 1: WITHOUT grahing, describe the transformation from the graph of f(x) to the graph of g(x).

a.	b.	c.
$f(x) = x$ $g(x) = 4x$ g(x) IS STEEPER	$f(x) = x$ $g(x) = \frac{1}{2}x - 3$ • g(x) IS FLATTER, SINCE $0 < \frac{1}{2} < 1$ • g(x) moves down: -3	$f(x) = x$ $g(x) = -x + 2$ • g(x) flips over y-axis (just as steep) • g(x): moves up 2

Set 5



$f(x) = |x|$

$f(0) = |0|$

$f(-3) = |-3|$

$F(2) = |2|$

x	y
0	0
-3	3
2	2

$g(x) = |x + 3|$

moved 3 ←

$g(0) = |0+3| = |3|$

$g(-3) = |-3+3| = |0|$

x	y
0	$|0+3|$ $|3| = 3$
-3	$|-3+3|$ $|0| = 0$
2	5

$g(2) = |2+3|$
$= |5|$

$h(x) = |x + 9|$

x	y
0	
-3	
2	

$j(x) = |x - 5|$

moved 5 →

$j(0) = |0-5|$
$= |-5|$

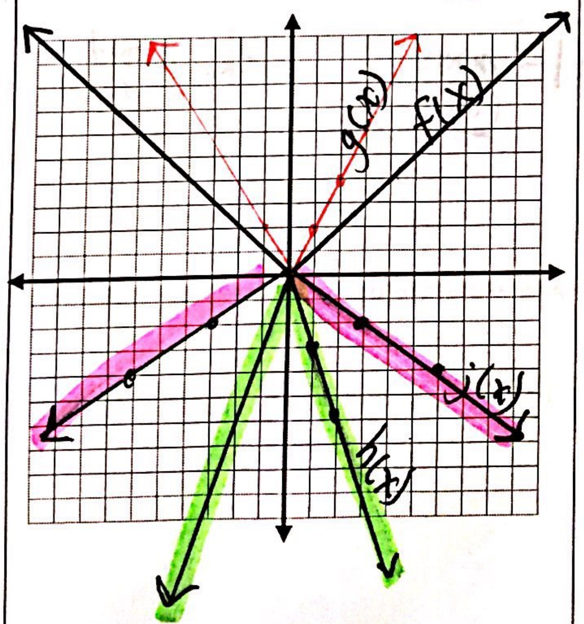
x	y
0	5
-3	8
2	3

$j(-3) = |-3-5|$
$= |-8| = 8$

$j(2) = |2-5|$
$= |-3| = 3$

Big idea of Set 5: $|x -|$ moves right | add/subtract inside abs. value makes graph move side to side | $|x +|$ ← moves left

Set 6



$f(x) = |x|$

$f(0) = |0| = 0$

$f(-2) = |-2| = 2$

$f(5) = |5| = 5$

x	y
0	0
-2	2
5	5

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

↑ slope

NARROWER

$g(0) = 2|0| = 0$

$g(-3) = 2|-3| =$
$2(3) = 6$

x	y
0	0
-3	6
2	8

$g(2) = 2|2|$
$= 2(4)$

$h(x) = -3|x|$

↑ slope

Even narrower but flipped over x-axis (down)

x	y
0	0
-3	-9
2	-6

$h(0) = -3|0| = 0$

$h(-3) = -3|-3| = -3(3)$

$h(2) = -3|2| = -3(2)$

$j(x) = -\frac{2}{3}|x|$

↑ slope

$j(0) = -\frac{2}{3}|0|$

$j(-3) = \frac{2}{3}|-3|$
$= -\frac{2}{3}(3)$
$= -6/3$

x	y
0	0
-3	-2
6	-4

$j(6) = -\frac{2}{3}|6|$
$= -\frac{2}{3}(6)$
$= -\frac{12}{3}$
$= -4$

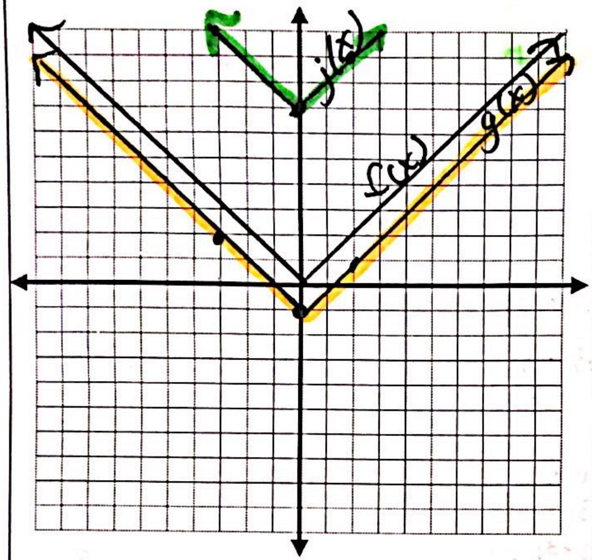
Big idea of Set 6:

$y = m|x|$

↑ STILL SLOPE

- bigger m → steeper
- smaller m → flatter
- a negative → flips over x-axis

Set 7



$f(x)=\|x\|$	$g(x)=\|x\|-1$	$h(x)=\|x\|-5$	$j(x)=\|x\|+$
	down 1	down 5	up 7
$f(0)=\|0\|$ $f(-7)=\|-7\|=7$ $f(9)=\|9\|=9$	$g(0)=\|0\|-1$ $g(-3)=\|-3\|-1$ $=3-1$		$j(0)=\|0\|+$ $j(-3)=\|-3\|+$ $=3+7$

x	y
0	0
-7	7
9	9

x	y
0	-1
-3	2
2	1

$g(2)=|2|-1$
$=2-1$

x	y
0	
-3	
2	

x	y
0	7
-3	10
2	9

$j(2)=|2|+7$
$=2+7$
$=9$

Big idea of Set 7: Adding / Subtracting outside of absolute value moves the graph up and down

Parent Function	Absolute value functions transformations		
$f(x)=\|x\|$	$g(x)=a\|x-h\|+k$		
	a	h	k
• LOOKS LIKE A V • CROSSES ORIGIN • WHEN X is positive, Slope = +1 • WHEN X IS NEGATIVE, Slope = −1	STEEPNESS: $a>1$: steeper than parent $0<a<1$: flatter a is negative: flips over x-axis	SIDE TO SIDE $\|x+h\|$ → moves LEFT $\|x-h\|$ → moves RIGHT	up / down +k: moves up −k: moved down

• symmetric around origin

Exit Ticket; Given $g(x)=-2|x+1|+3$, compare how it looks to the parent function $f(x)=|x|$ without graphing.