

# Algebra 1

## Linear Equations Project Effects of Changing Slope and Y-Intercept

Name: \_\_\_\_\_

Due Date: \_\_\_\_\_

Period: 5<sup>th</sup>

Slope - Intercept Form

$$y = m x + b$$

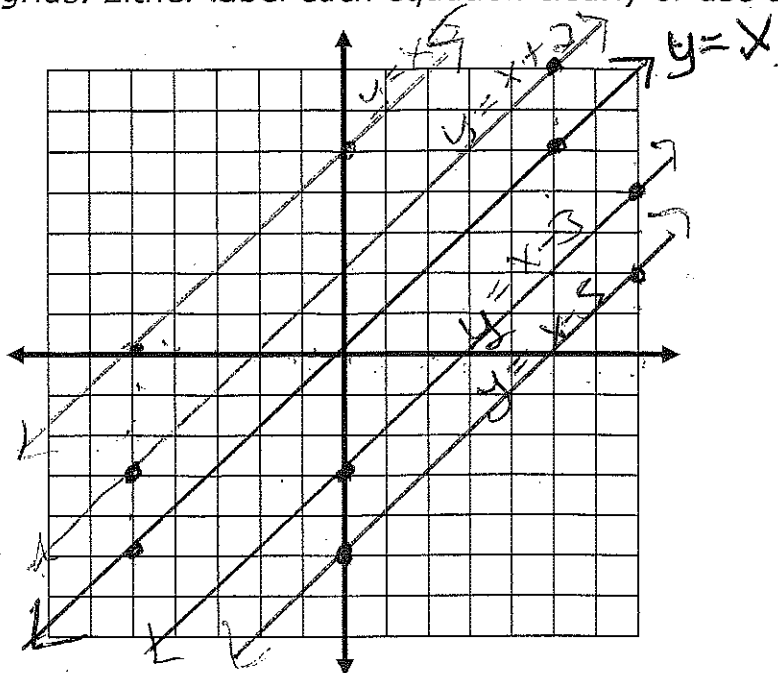
$m$  : slope

$b$  : y-intercept

Linear Parent Function :  $y = x$

Graph each equation using your graphing calculator. **Accurately** draw each graph onto the grids. Either label each equation clearly or use colored pencils to identify the graphs.

1.



Parent Graph:  $y = x$   
 $(-5, -5) (5, 5)$   
 $y = x + 2$   
 $(-5, -3) (5, 7)$   
 $y = x + 5$   
 $(5, 0) (0, 5)$   
 $y = x - 3$   
 $(0, -3) (7, 4)$   
 $y = x - 5$   
 $(0, -5) (7, 2)$

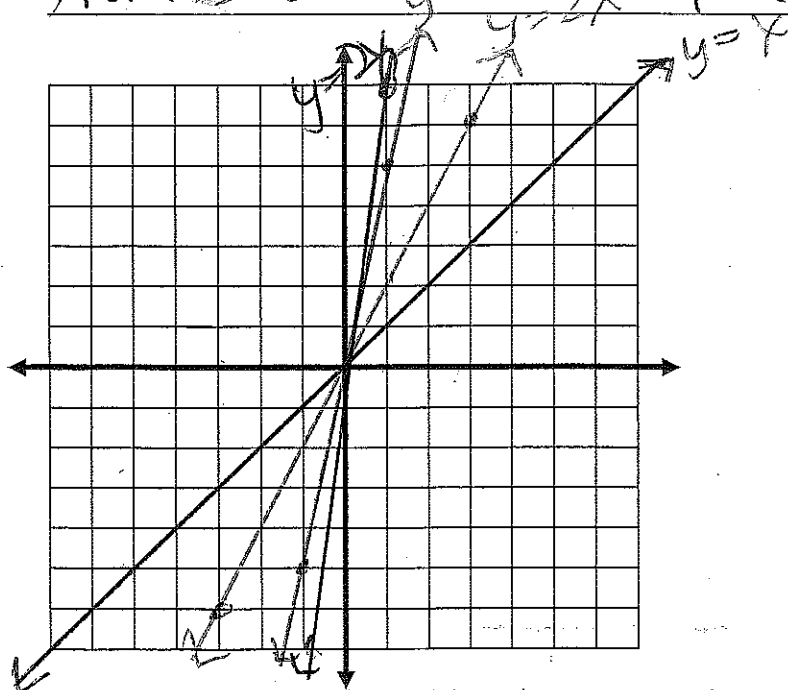
→ plot 3 pts  
 → 1) y-intercept  
 2) Above  
 3) below

Compare the graphs. Write about your observations. same slope → parallel

Changing  $b$ : shifts graph up/down

Adding to  $b$  shift graph up; subtracting from  $b$  shift the graph down

2.



Graph:  $y = x$  Parent

$$y = 2x$$

$(-3, -6) (3, 6)$

$$y = 5x$$

$(1.5, -5) (-1.5, 5)$

$$y = 7x$$

$(1, 7) (-1, -7)$

Compare the graphs. Write about your observations.

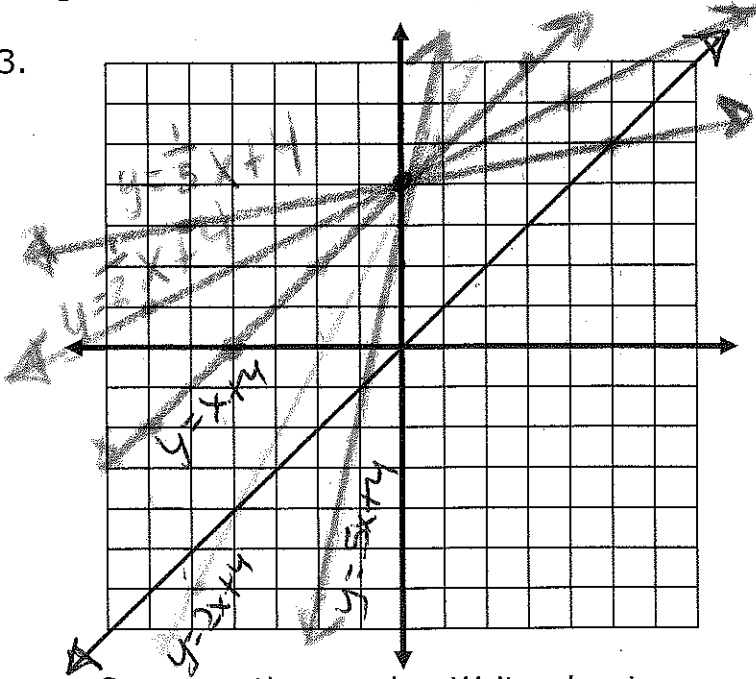
Changing  $m$  (slope) affects

steepness; these were all

steeper than the parent; same  $b$ ,  
 $y$ -intercepts → all went through  $(0, 0)$

Graph each equation using your graphing calculator. **Accurately** draw each graph onto the grids. Either label each equation clearly or use colored pencils to identify the graphs.

3.



Graph:  $y = x$  Linear Parent

$y = x + 4$  same slope

steeper  $\left\{ \begin{array}{l} y = 2x + 4 \end{array} \right.$   $(-5, -4), (0, 4)$   
 $\left\{ \begin{array}{l} y = 5x + 4 \end{array} \right.$   $(-2, -4), (0, 4)$

flatter  $\left\{ \begin{array}{l} y = \frac{1}{2}x + 4 \end{array} \right.$   $(-6, 1), (0, 4)$   
 $\left\{ \begin{array}{l} y = \frac{1}{5}x + 4 \end{array} \right.$   $(4, 6)$

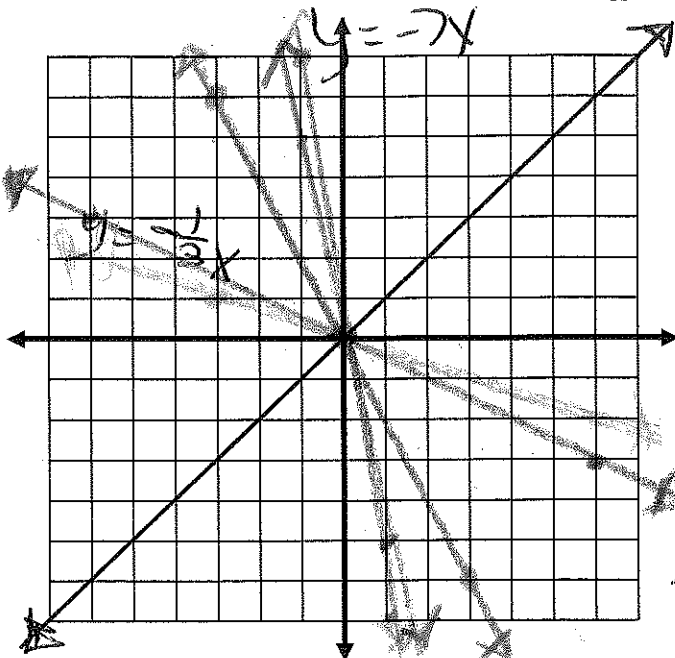
Compare the graphs. Write about your observations.

All graphs shifted up 4 units ( $b: +4$ )

2 were steeper; 2 were flatter

All increasing graphs (All uphill) (+slope)

4.



Graph:  $y = x$  Linear Parent

$(0, 0)$  y-int origin

$\left\{ \begin{array}{l} y = -2x \end{array} \right.$

$\left\{ \begin{array}{l} y = -5x \end{array} \right.$

$\left\{ \begin{array}{l} y = -7x \end{array} \right.$

$\left\{ \begin{array}{l} y = -\frac{1}{2}x \end{array} \right.$

$\left\{ \begin{array}{l} y = -\frac{1}{3}x \end{array} \right.$

Compare the graphs. Write about your observations.

All the  $m$ 's (slope) are negative

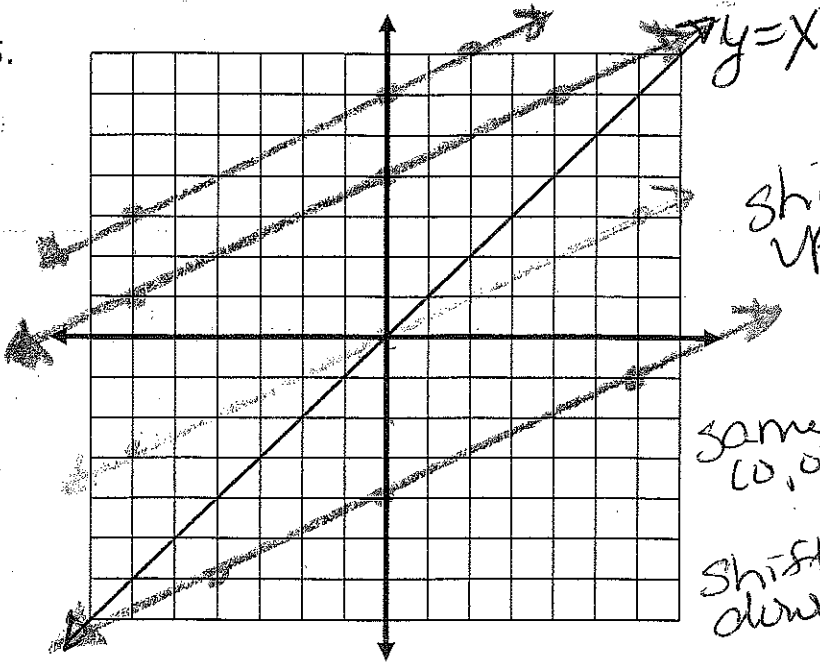
All have a  $b=0$  pt  $(0, 0)$  origin

All decreasing graphs (All downhill)

Absolute value  $|-2| = |2| \rightarrow$  ~~sign~~ sign of slope doesn't affect steepness

Graph each equation using your graphing calculator. **Accurately** draw each graph onto the grids. Either label each equation clearly or use colored pencils to identify the graphs.

5.



Graph:  $y = x$

shift up  $\left\{ \begin{array}{l} y = \frac{1}{2}x + 4 \end{array} \right. \begin{array}{l} (0, 4) \\ (-6, 1) \end{array} \quad \begin{array}{l} (4, 6) \end{array}$

$\left\{ \begin{array}{l} y = \frac{1}{2}x + 6 \end{array} \right. \begin{array}{l} (0, 6) \\ (-6, 3) \end{array} \quad \begin{array}{l} (2, 7) \end{array}$

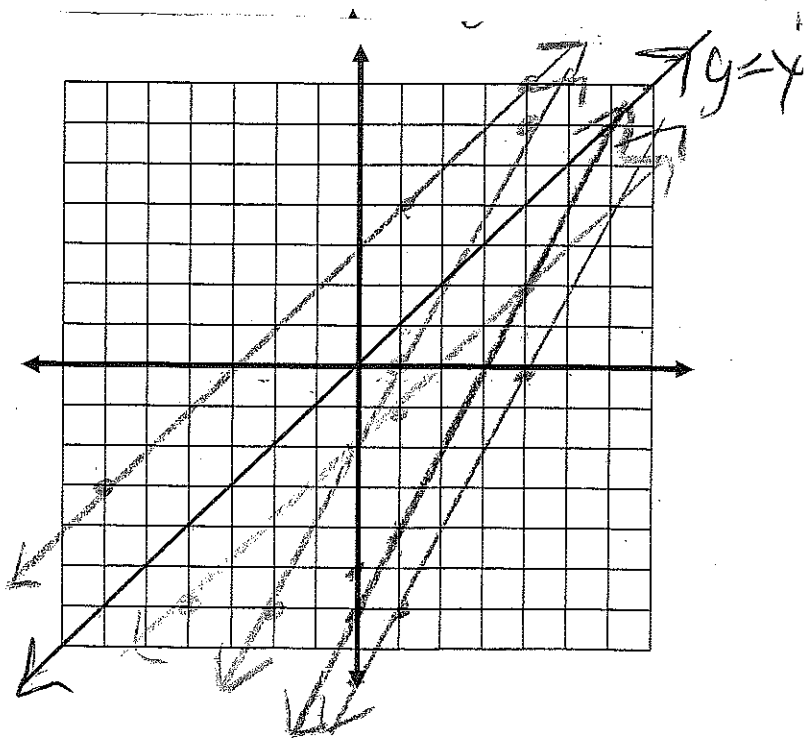
same b  $\left\{ \begin{array}{l} y = \frac{1}{2}x \end{array} \right. \begin{array}{l} (0, 0) \\ (-6, -3) \end{array} \quad \begin{array}{l} (6, 3) \end{array}$

shift down  $\left\{ \begin{array}{l} y = \frac{1}{2}x - 4 \end{array} \right. \begin{array}{l} (0, -4) \\ (6, -1) \end{array} \quad \begin{array}{l} (4, -6) \end{array}$

Compare the graphs. Write about your observations.

All graphs have a slope of  $\frac{1}{2}$  & are parallel; flatter than parent graph; different b's, y-int, so shifted up/down the y-axis

6.



Start by graphing  $y = x$

Now translate up 3 units  $y = x + 3$

Then shift down 5 units  $y = x - 2$

Next, double the slope  $y = 2x - 2$

Then translate down 6 more units  $y = 2x - 8$

Finally, shift up 2 units.

$y = 2x - 6$

Use your observations from the previous graphing exercises to answer the following questions.

$$y = mx + b$$

1. In general, how does changing the slope in the equation affect the graph?

Changing the slope affects the steepness

2. In general, how does changing the y-intercept in the equation affect the graph?

Changing the b, y-intercept, shifts (translates) the graph up (+b) or down (-b)

3. In general, how does changing the sign of the slope affect the graph?

Changing the sign of slope changes it from an increasing graph (+slope) to decreasing graph (-slope)

4. In general, what can you say about the magnitude of the slope and the steepness of the line?

The greater the magnitude (greater absolute value) the steeper it is. ex:  $y = \frac{1}{2}x$  or  $y = -5x$   
steep

5. Describe the change in a graph  $y = 3x - 2$  if the slope is changed to 1.

m changes from 3 to 1 so it gets flatter

6. What would happen to a graph if you increased the y-intercept but did not change the x-intercept?

7. What would happen to a graph if you decreased the y-intercept but did not change the x-intercept?

8. How would you change the equation of a line to make the graph flatter?

9. How would you change the equation of a line to make the graph translate down?

10. Describe the relationship between the graphs of the lines represented by the equations  $y = 3x + 4$  and  $y = 3x - 2$ .