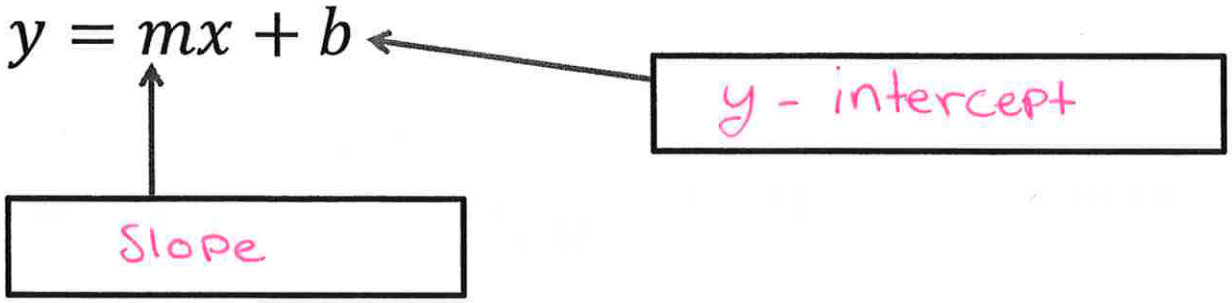
M9

$y = mx + b$

5.7

- $y = mx + b$ is a Slope - intercept form of the equation of a line.



Recall: y-intercept is the point where a graph intersects or touches the y-axis.
Note: A line will always intersect the y-axis unless the line is vertical.

- A vertical line will do one of two things: A = it will never intersect the y-axis or B = it will fully coincide with the y-axis.

Slope = is the pattern number when we use a sentence to describe a pattern: " when x increases by one, y increases/decreases by a number".

Slope = the measure of steepness of a line.

Slope = ratio of rise to run expressed as a fraction.

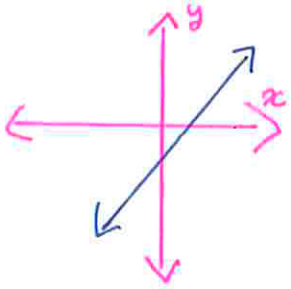
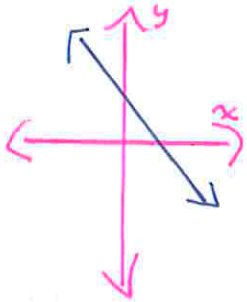
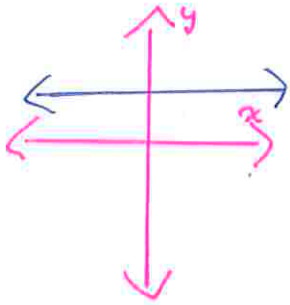
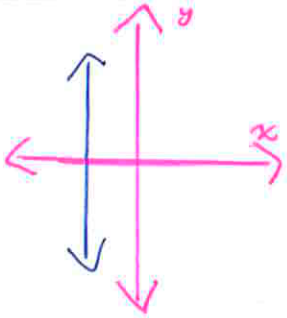
$$slope = m = \frac{rise}{run} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Where x_1 and y_1 are coordinates of point P_1, x_2 and y_2 are coordinates of point P_2 and both points are on the line.

- The steeper the line = the large is the number "m".

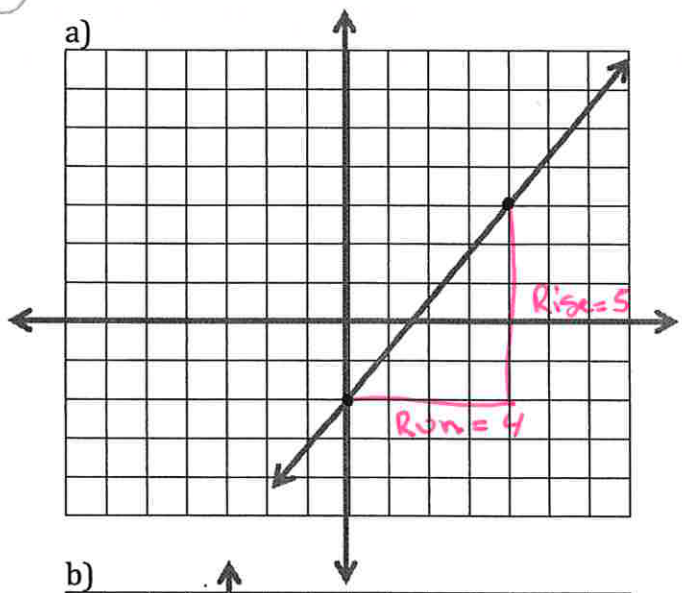
Slope = $\frac{\uparrow \text{ or } \downarrow}{\rightarrow \text{ or } \leftarrow}$

➢ We can categorize the slope of a line in one of the four types:

Positive Slope	Negative Slope	Zero Slope	Undefined = Infinite Slope
			
The line in increasing.	The line is decreasing.	The line is horizontal = flat.	The line is vertical.
$m > 0$	$m < 0$	$m = 0$	$m \ is \ undefined$
$y = +\#x + b$	$y = -\#x + b$	$y = \pm\#$	$x = \pm\#$

You can determine a slope of a line from a graph by drawing in a useful right-angled triangle:

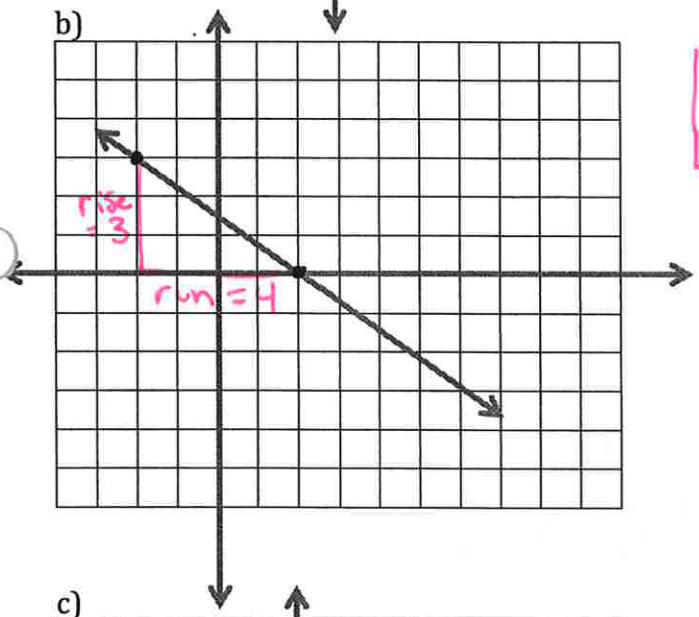
a)



$m = \frac{\text{rise}}{\text{run}}$

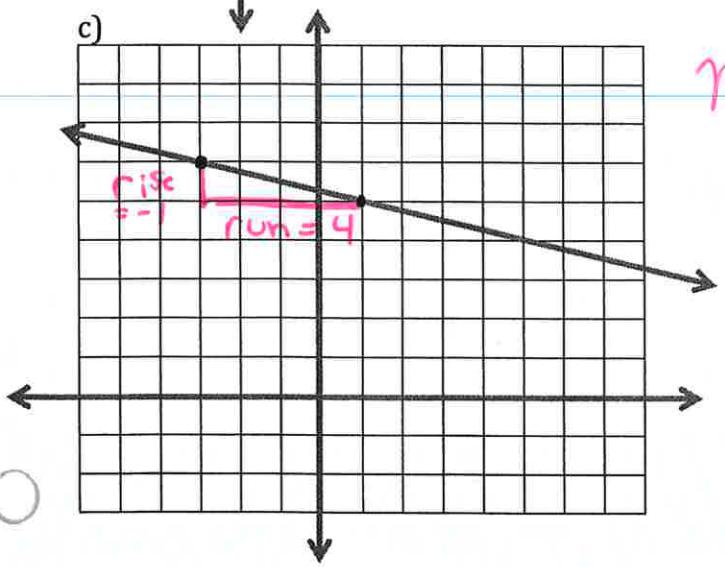
$m = \frac{5}{4}$ "up five over four"

b)



$m = \frac{-3}{4}$ "down three over four"

c)



$m = \frac{-1}{4}$ "down one, over four"

➢ You can calculate the slope of line given coordinates of two points that are on the line. Use the formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

a) Determine the slope of a line that passes through $A\ (-2,5)$ and $B\ (6,7)$.

$m = \frac{1}{4}$

b) Determine the slope of a line that passes through $A\ (0,3)$ and $B\ (-9,4)$.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4-3}{-9-0} = \frac{1}{-9} = \frac{-1}{9}$

$M = \frac{-1}{9}$

c) Determine the slope of a line that passes through $A\ (14,-6)$ and $B\ (12,-7)$.

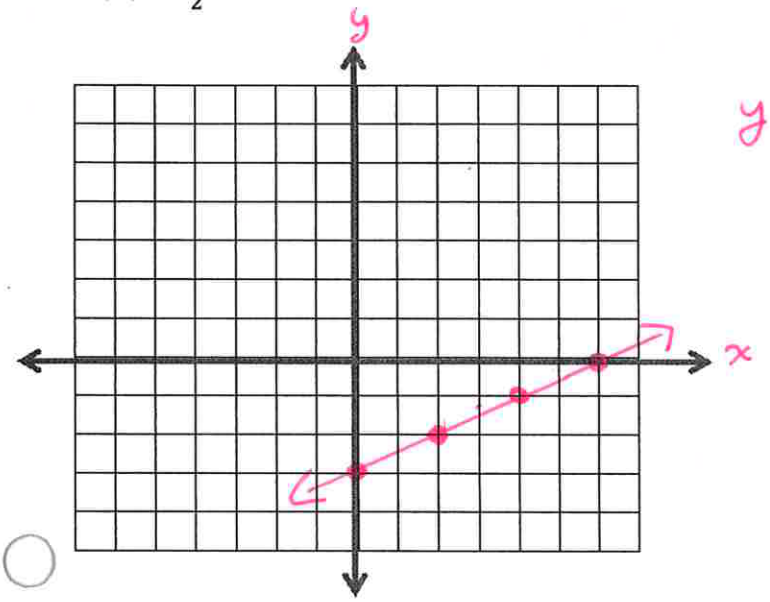
$x_1\ y_1 \qquad x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7-(-6)}{12-14} = \frac{-7+6}{-2} = \frac{-1}{-2} = \frac{1}{2}$

$M = \frac{1}{2}$

Practice graphing a line given an equation:
Note: If the equation given to you is not in *y=mx+b* form, use algebra to change the equation so it is in the form ***y=mx+b*** .

a) $y = \frac{1}{2}x - 3$



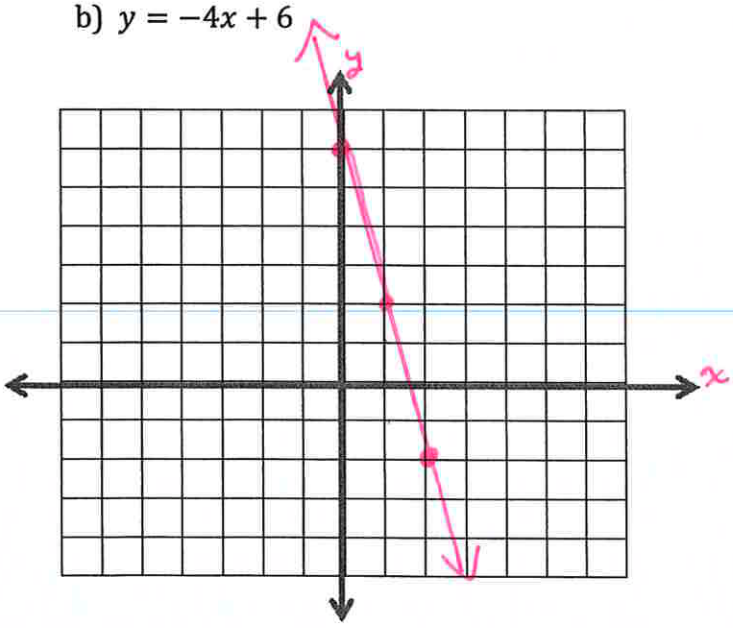
* so ↑

y intersept

$y = \frac{1}{2}x - 3$

+ So across 2

b) $y = -4x + 6$



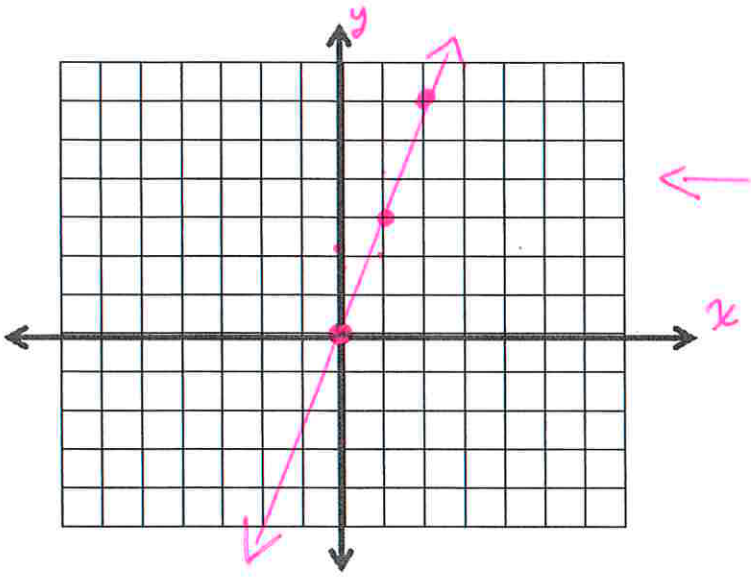
$y = -4x + 6$

$y = \frac{-4}{1}x + 6$

("up 3 over 1")

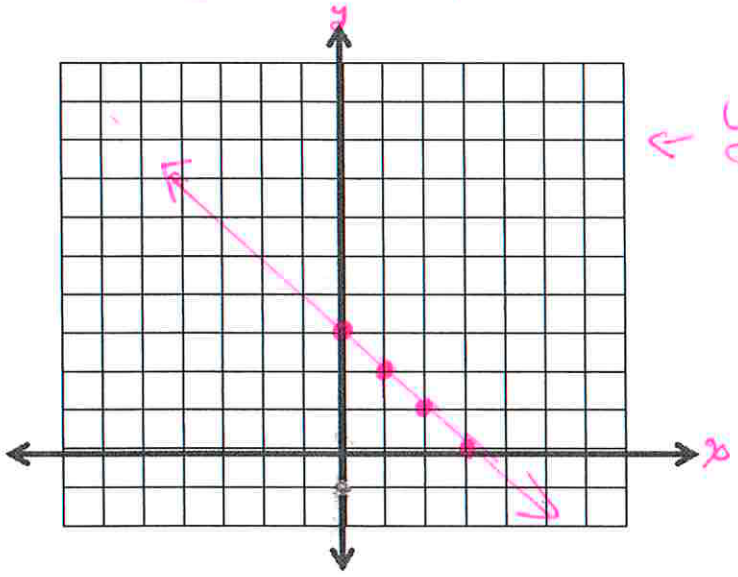
c) $y = 3x$ → $y = \frac{3}{1}x + 0$

Slope = $\frac{\uparrow\downarrow}{\rightarrow}$



← $y = \frac{3}{1}x + 0$

d) $y = -\frac{1}{1}x + 3$



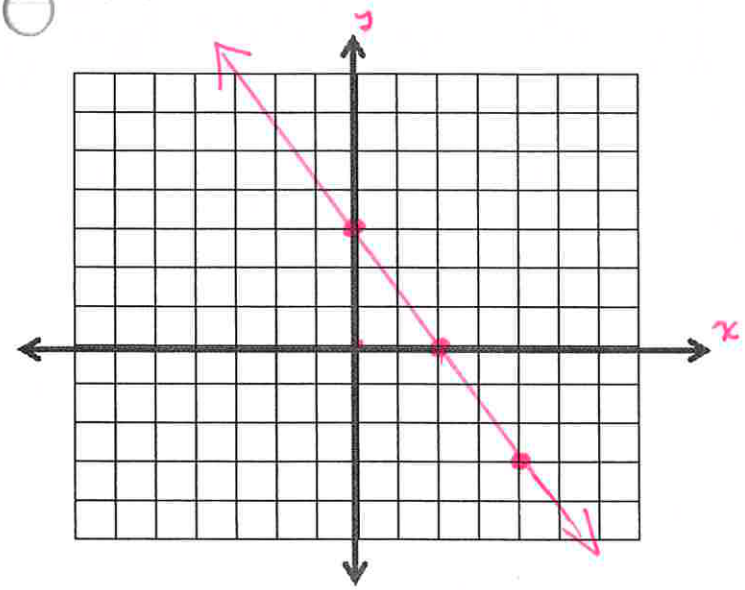
← $y = \frac{-1}{1}x + 3$

LVL 4 ! Turn $y = mx + b$ using Algebra !

$y = (m)x + (b)$ — slope, y intersept

Slope = "pattern #" = $\frac{\text{Rise}}{\text{run}}$ = Natur of Steep

e) $4y - 12 = -6x$



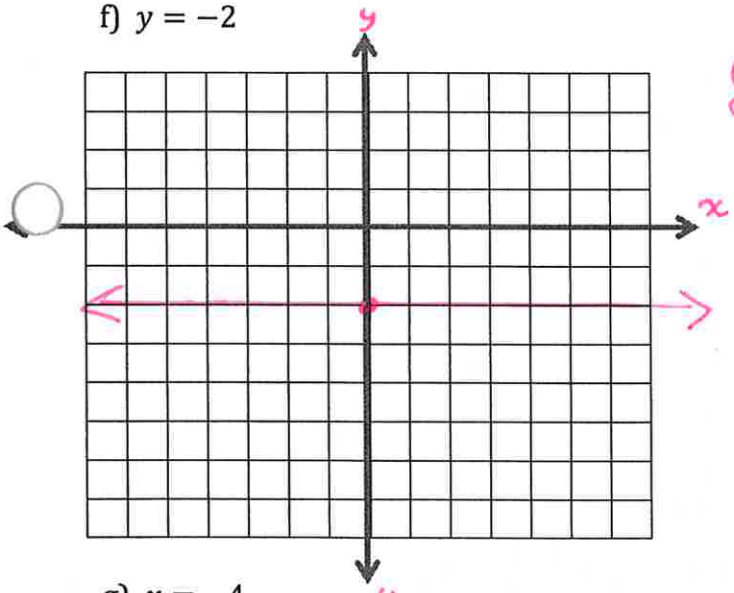
$4y - 12 = -6x$

$+12 \quad +12$

$\frac{4y}{4} = \frac{-6x}{4} + \frac{12}{4}$

$y = \frac{-3}{2}x + 3$

f) $y = -2$

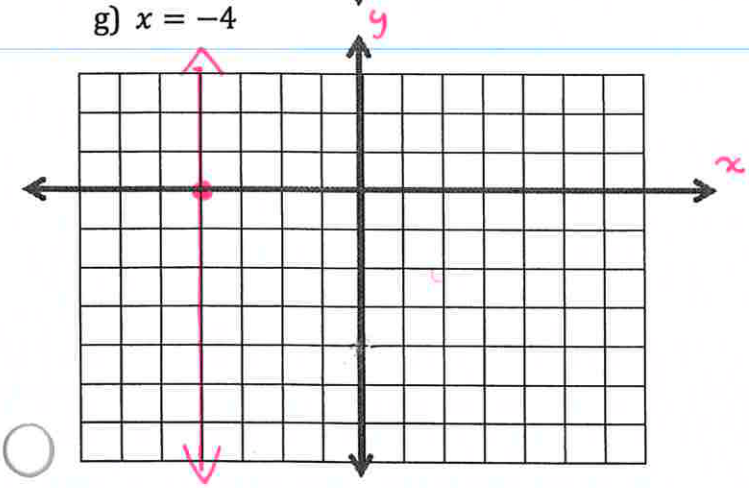


$y = -2 \rightarrow$ no $x \Rightarrow$ horizontal line.

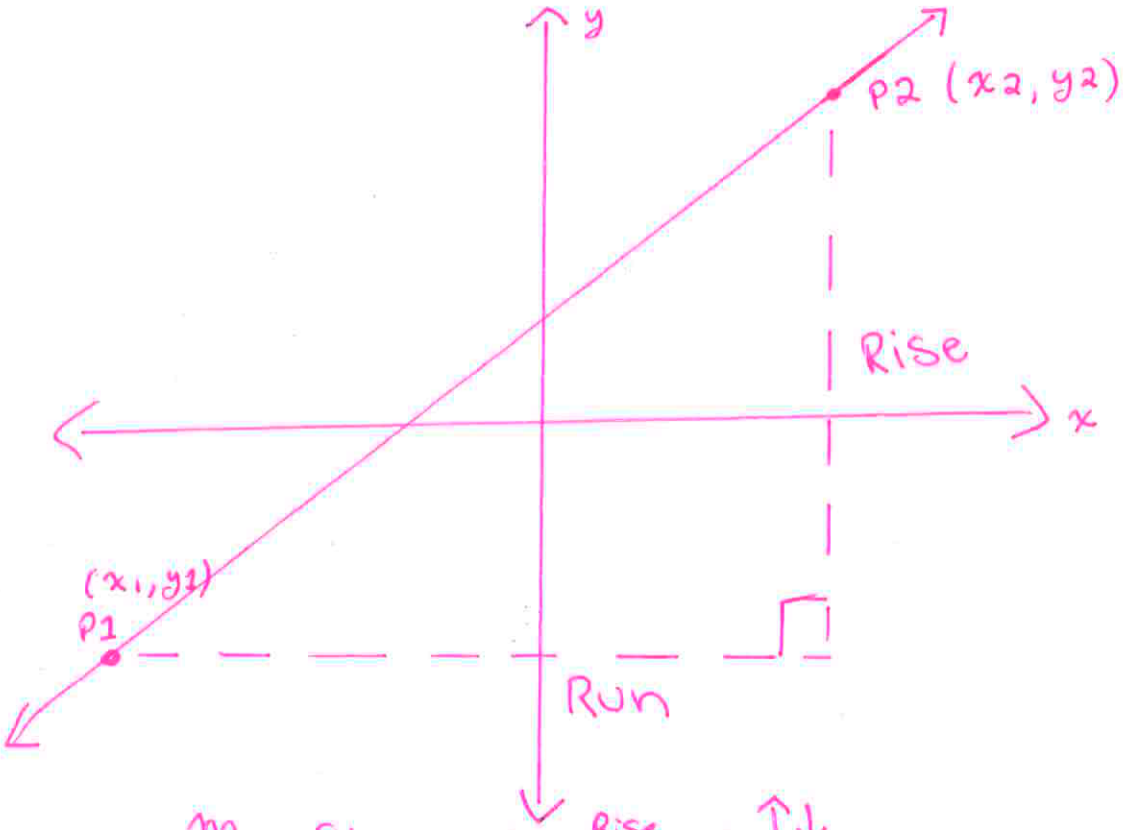
$\downarrow$

$y = 0x - 2$

g) $x = -4$

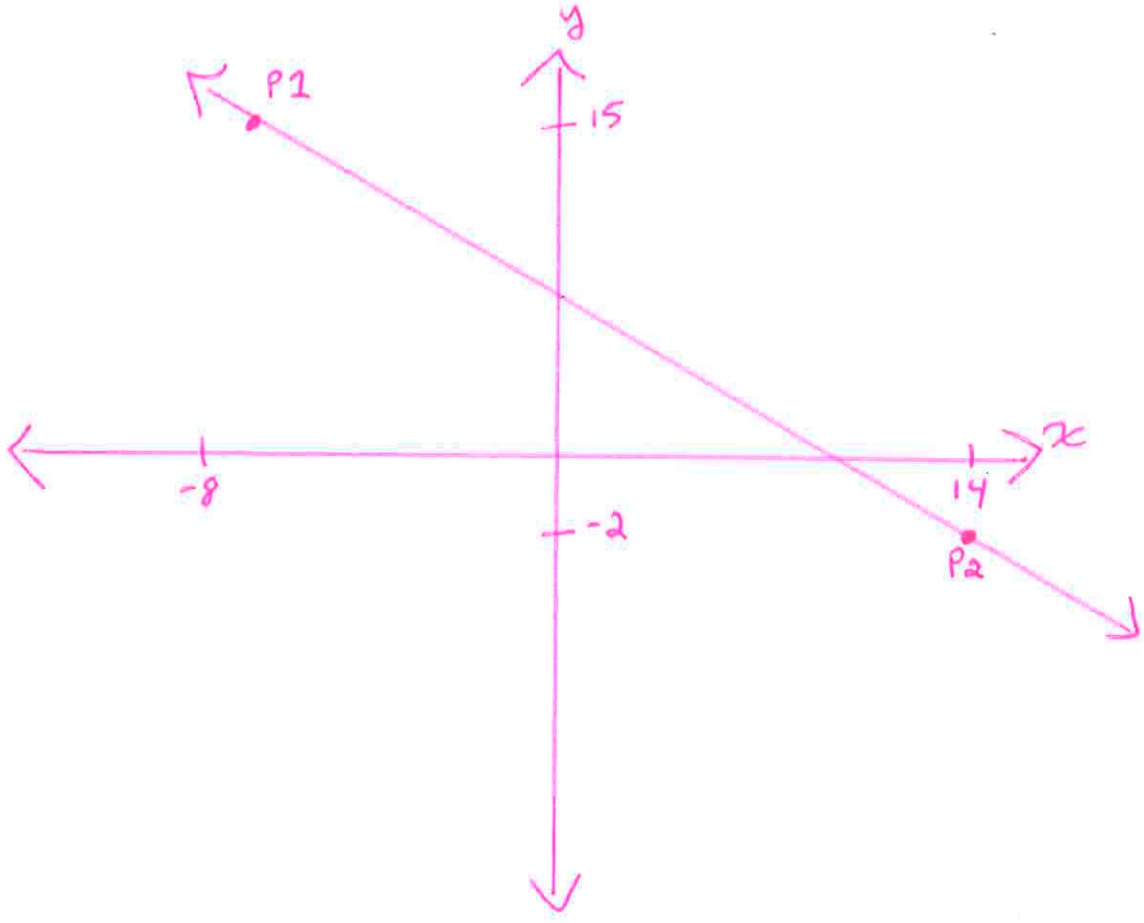


$x = -4 \rightarrow$ no $y \Rightarrow$ Vertical line



m = Steepness = $\frac{\text{Rise}}{\text{Run}} = \frac{\uparrow\downarrow}{\rightarrow}$

P1 (-8, 15)
P2 (14, -2)



$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{-2-15}{14-(-8)}$

$m = \frac{-17}{14+8}$

$m = \frac{-17}{22}$