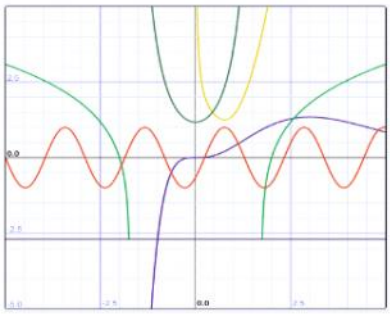
Lesson 0 Equation of a Line

Date:

Chapter 4: Linear and Quadratic Functions:



Lesson 0 :

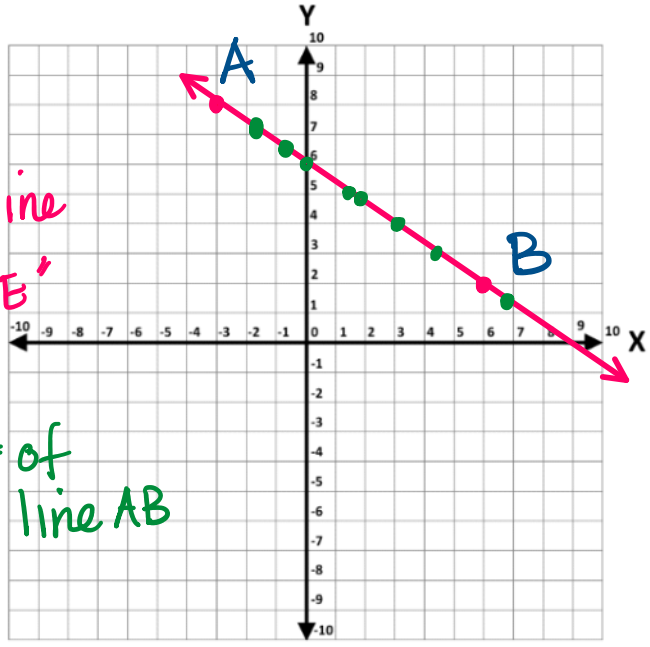
Equation of a Line

a way to describe a relationship between two variables.

using #, notation

A (-3 8)

B (6,2)



'steepness' of line

aka "SLOPE"

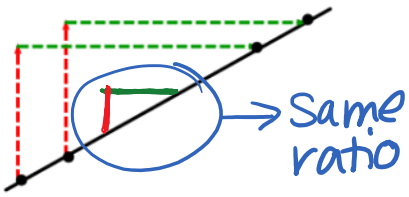
infinite # of points on line AB

Same relationship between x and y

Finding the slope between two points

The slope (or gradient) between two points is calculated by the change in y-value (rise) divided by the change in the x-value (run):

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



Ex. Given A (-3, 8) and B(6, 2) find the slope.

- label your points

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 8}{6 - -3} = \frac{-6}{9} = -\frac{2}{3}$$

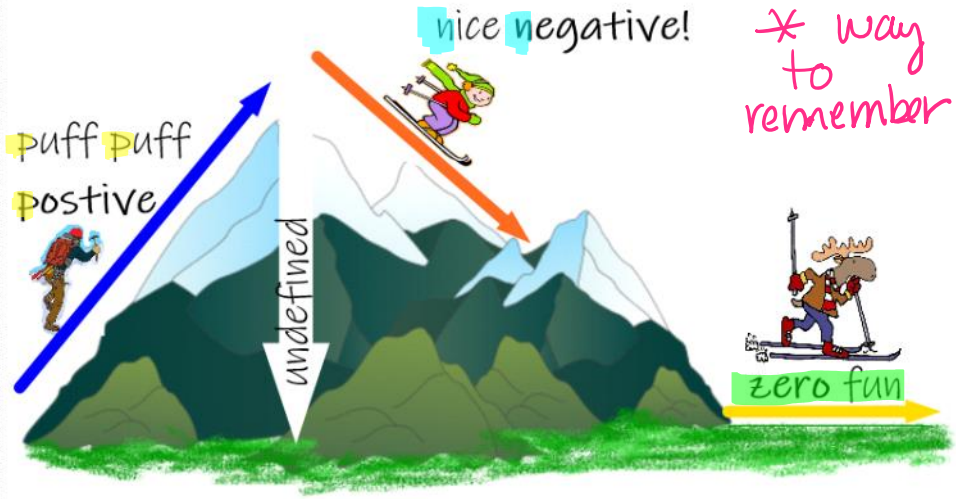
Remember:

$$\frac{-2}{3} = \frac{2}{-3} = -\frac{2}{3}$$

$\neq -0.66$

$\neq -0.67$

* fractions or terminating decimal numbers



* way to remember

remember your slopes

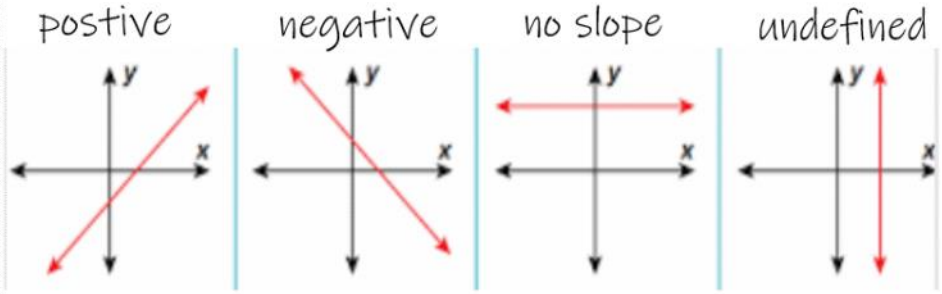
the bigger the number the steeper the slope

→ further away from zero

the bigger the number the steeper the slope

↳ further away from zero (+ or −)

Four different possibilities



equations of a line:

$$y = ax + b$$

y-intercept "initial value" where it intercepts (crosses) y-axis

a = SLOPE

ex $y = 3x + 2$

ex $y = -\frac{7}{3}x - 1$

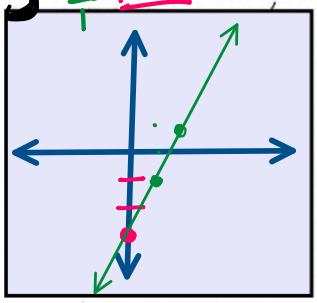
ex $y = \frac{4}{5}x + \frac{7}{9}$

ex $y = 8$

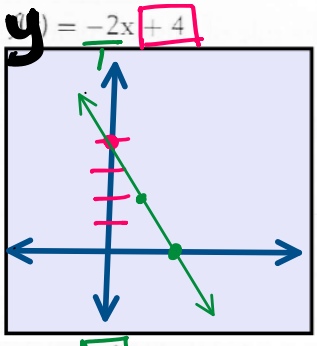
ex $y = 8$

Draw this line.

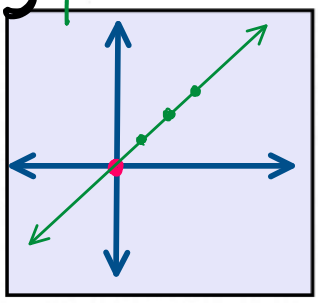
$y = 2x - 3$



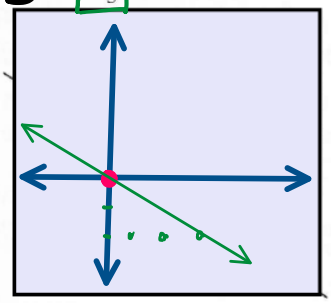
$y = -2x + 4$



$y = \frac{1}{1}x + 0$



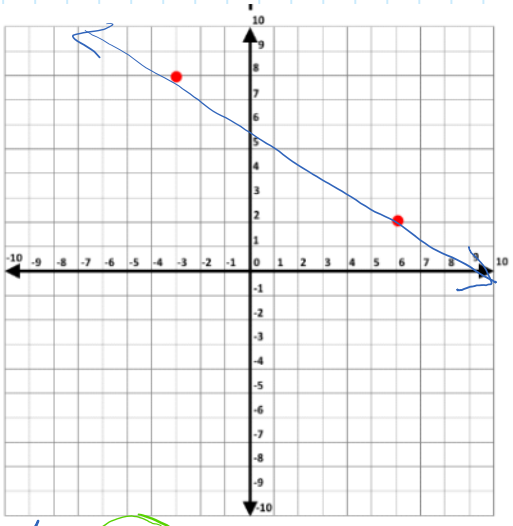
$y = -\frac{2}{3}x + 0$



(x_1, y_1) (x_2, y_2)

A (-3 8) B (6,2)

1. find slope
2. write $y = ax + b$
3. substitute slope of "a"
4. substitute x and y with one point
5. solve for "b"
6. write complete equation



(1) $a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-8}{6+3} = \frac{-6}{9} = -\frac{2}{3}$

(2) $y = ax + b$

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

(4) $2 = -\frac{2}{3}(6) + b$

$2 = -4 + b$

② $y = ax + b$

③ $y = -\frac{2}{3}x + b$

$2 = -\frac{2}{3}(6) + b$

$2 = -4 + b$

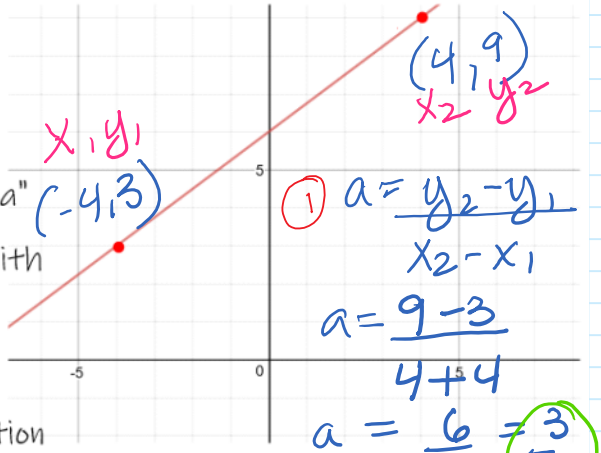
⑤ $6 = b$

Rule

⑥ $y = -\frac{2}{3}x + 6$

Finding the Equation of a Straight Line

1. find slope
2. write y= ax + b
3. substitute slope of "a"
4. substitute x and y with one point
5. solve for "b"
6. write complete equation



$(4, 9)$ x_2, y_2

x_1, y_1 $(-4, 3)$

① $a = \frac{y_2 - y_1}{x_2 - x_1}$

$a = \frac{9-3}{4+4}$

$a = \frac{6}{8} = \frac{3}{4}$

② $y = ax + b$

③ $y = \frac{3}{4}x + b$

④ $9 = \frac{3}{4}(4) + b$

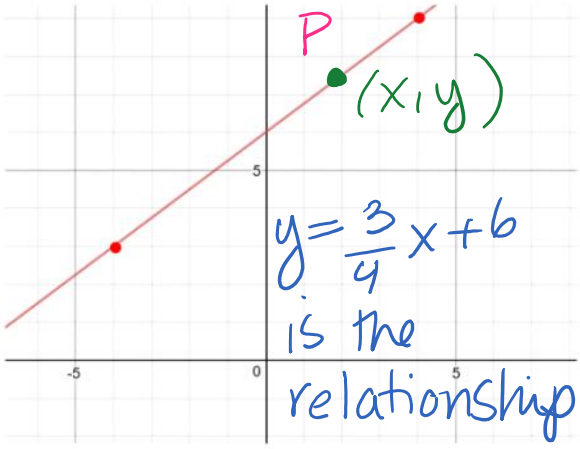
$9 = 3 + b$

⑤ $b = 6$

⑥ Rule $y = \frac{3}{4}x + 6$

When we have the rule.....we have EVERYTHING

you can find every point P on this line



$y = \frac{3}{4}x + 6$ is the relationship.

ex let $x = 2$

$y = \frac{3}{4}(2) + 6$

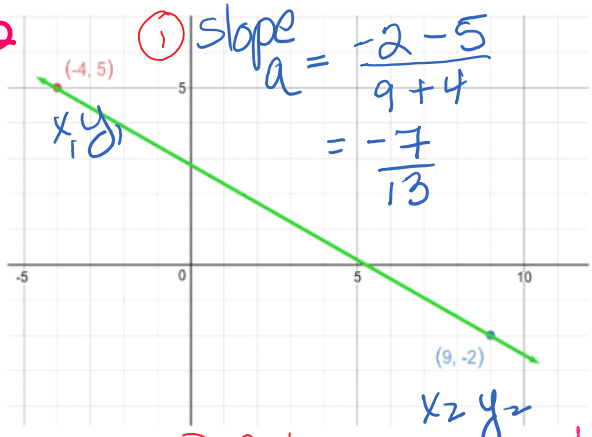
$y = \frac{6}{4} + 6$

$y = \frac{6}{4} + \frac{24}{4} = \frac{30}{4} = 7.5$

$\therefore (2, 7.5)$ is on line

When we have the rule.....we have EVERYTHING

find y when x=22



① slope $a = \frac{-2-5}{9+4} = \frac{-7}{13}$

you can find every point on this line

② $y = ax + b$

③ $y = \frac{-7}{13}x + b$

④ $5 = \frac{-7}{13}(-4) + b$

$5 = \frac{28}{13} + b$

⑤ $b = 5 - \frac{28}{13} = \frac{65}{13} - \frac{28}{13} = \frac{37}{13}$

⑥ Rule

$$y = \frac{-7}{13}x + \frac{37}{13}$$

let x = 22

$y = \frac{-7}{13}(22) + \frac{37}{13}$

$= \frac{-154}{13} + \frac{37}{13}$

$= \frac{-117}{13} = -9$

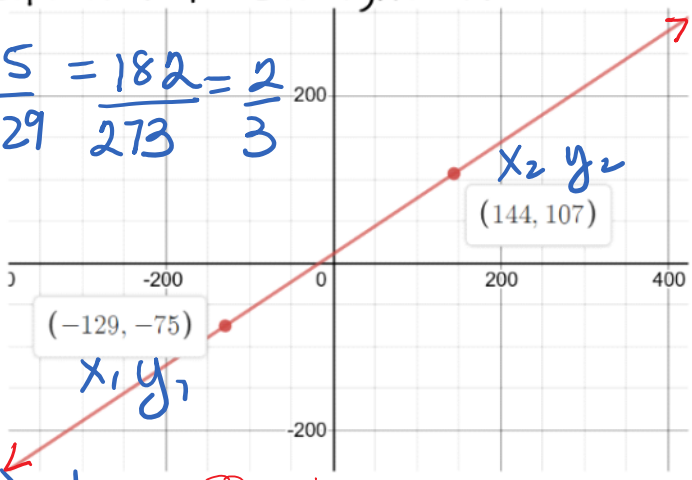
Finding the Equation of a Straight Line

SLOPE

① $a = \frac{107+75}{144+129} = \frac{182}{273} = \frac{2}{3}$

② $y = ax+b$

③ $y = \frac{2}{3}x+b$



④ $107 = \frac{2}{3}(144)+b$

$107-96 = b$

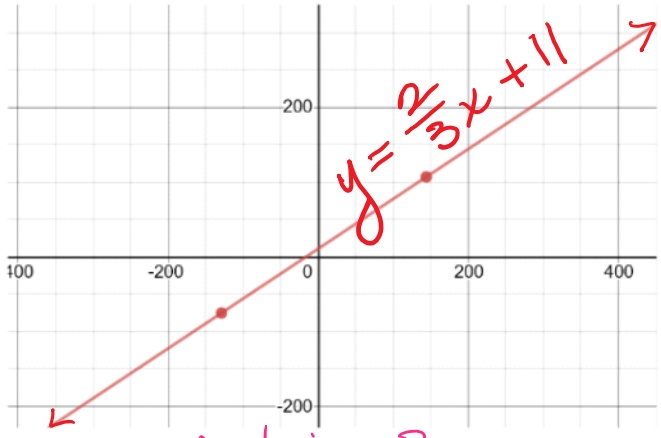
⑤ $b = 11$

⑥ Rule

$y = \frac{2}{3}x+11$

When we have the rule.....we have EVERYTHING

you can find **every** point on this line



ex When $y = 37$, what is x?

$37 = \frac{2}{3}x+11$

$37-11 = \frac{2}{3}x$

$\left(\frac{3}{2}\right)26 = \frac{2}{3}x\left(\frac{3}{2}\right)$

$39 = x$

When we have the rule.....we have EVERYTHING

the RULE is the key that unlocks EVERYTHING.

→ to find rule:

- 2 points

or

- slope + 1 point

you can now do:

Worksheets

- Slope of Straight Line Through Two Points
- Slope of Straight Lines
- Writing Linear Equations From a Graph

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