

Your Name
Mrs. Theo
9/23/21
Notes

Writing Linear Functions

Rate of Change

a ratio comparing one quantity to another

remember:
 $Speed = \frac{\text{distance over time}}$ $Speed : \frac{d}{t}$

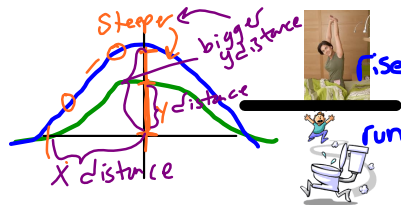
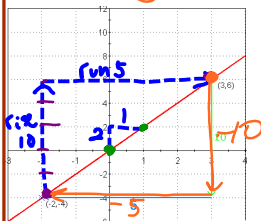
Slope

ratio of ^{1st} the change in y coordinate to the change in x coordinate

(x_1, y_1) (x_2, y_2) ^{2nd}

FORMULAS

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{change in y}}{\text{change in x}} = \frac{\text{rise}}{\text{run}}$$

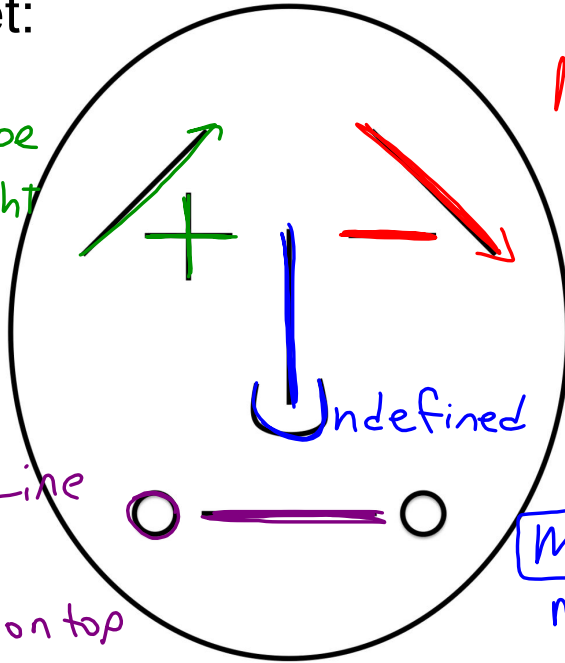


$$m = \frac{10}{5} = \frac{2}{1} = 2 = \frac{-10}{-5}$$

- No matter the two points slope will have the same ratio.
- Linear Functions always have a constant rate of change/slope

Don't forget:

Positive Slope
Up to the right
 $m = \frac{2}{3} = \frac{-2}{-3}$



Negative Slope
down to the right
 $m = -\frac{2}{3}$

Horizontal Line
 $m = 0$
 $m = \frac{0}{5}$ 0 is on top

Vertical Line
 $m = \text{undefined slope}$
 $m = \frac{5}{0}$ can't ÷ by 0

$y = \text{a number}$ **MR. SLOPE GUY**

$x = \text{a number}$

Finding Slope from Points

1. label the first coordinates x_1 and y_1
2. label the second coordinates x_2 and y_2
3. Substitute and simplify

Slope formula

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

x_1, y_1, x_2, y_2
 $(6, 3), (7, -4)$

x_1, y_1, x_2, y_2
 $(-2, -5), (-7, 8)$

$$m = \frac{(-4) - (3)}{(7) - (6)} = \frac{-7}{1} = -7$$

$$m = \frac{(-5) - (8)}{(-2) - (-7)} = \frac{-13}{5}$$

$$m = \frac{(3) - (-4)}{(6) - (7)} = \frac{7}{-1} = -7$$

$$m = \frac{8 - (-5)}{(-7) - (-2)} = \frac{13}{-5}$$

You can start with either point

Finding Slope from a Table

1. subtract the y's
2. subtract the x's
3. divide y difference/x difference

Or pick two points and use $m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{4 - 2}{2 - 1} = 2$ $m = \frac{0}{4} = 0$ $m = \frac{2}{0} = \text{Undefined slope}$

x	y
-3	-1
-1	3
0	5
...	...
4	13

$m = \frac{4 - 2}{2 - 1} = 2$ $m = \frac{0}{4} = 0$ $m = \frac{2}{0} = \text{Undefined slope}$

x	y
-4	-2
0	-2
4	-2

x	y
5	-3
5	-1
5	1

Horizontal line: $y = -2$
 Vertical line: $x = 5$

slope-intercept form

Determine the Slope and y-Intercept

Given: Slope Intercept Form

$y = mx + b$

Slope is # in front of x

Coordinate Point

y-intercept is # added and is (0, ?)

Note: x is (0, b)

ex. $y = -3x - 5$

$y = \frac{2}{3}x + 9$

slope: $m = -3 = \frac{-3}{1} = \frac{3}{-1}$

slope: $m = \frac{2}{3} = 0.\overline{6} = \frac{-2}{-3} = \frac{4}{6}$

Y-intercept: (0, -5)
 $b = -5$

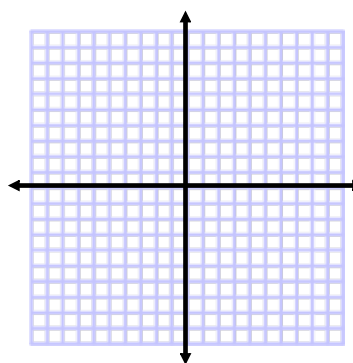
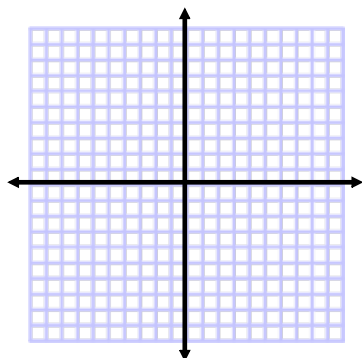
Y-intercept: (0, 9)
 $b = 9$

Graphing
a Line

1. Make a point at the y-intercept (0,b)
2. From the point move up and over the slope and make a point where you finish
3. Connect the points with a straight line

$(0,-4) m= -3$

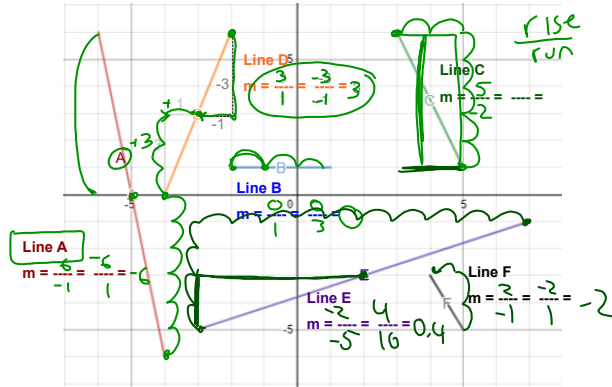
$y = \frac{2}{5}x + 1$



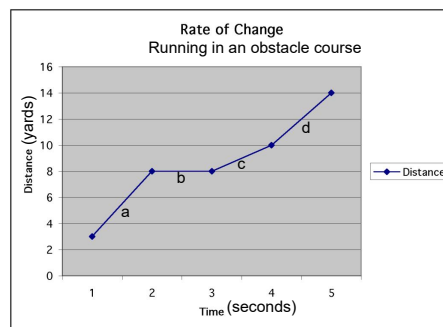
Let's practice!

Board Work!

Determine the Slope for each line. Write it as a fraction two different ways and as a decimal.



2. Use the graph of the speed a competitor was running during an obstacle course, to answer questions a-e.



- a. The slope of a is $m =$
- b. The slope of b is $m =$
- c. The slope of c is $m =$
- d. The slope of d is $m =$
- e. Interpret and explain a possible scenario of what was happening during the obstacle course by looking at the slopes of the lines.

1. subtract the ys
2. subtract the xs
3. divide y difference/x difference

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

Or pick two points and use

$$m = \frac{-3}{0}$$

$$m = \frac{-12}{2} = \frac{-6}{1} = -6$$

$$m = \frac{0}{15} = \frac{0}{-15} = 0$$

x	y
-4	-2
-4	-5
-4	7
-4	0

$$x = -4$$

x	y
-3	15
-1	3
0	-3
2	-15

x	y
-5	50
20	50
5	50

$$y = 50$$

Finding Slope from Points

1. label the first coordinates x_1 and y_1
2. label the second coordinates x_2 and y_2
3. Substitute and simplify

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

$$\begin{array}{cc} \text{1st} & \text{2nd} \\ (13, -5), & (-9, 6) \\ x_1, y_1 & x_2, y_2 \end{array} \qquad \begin{array}{cc} \text{1st} & \text{2nd} \\ (5, -4), & (7, -4) \\ x_1, y_1 & x_2, y_2 \end{array}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - (-5)}{-9 - 13} = \frac{11}{-22} = -\frac{1}{2} \qquad m = \frac{-4 - (-4)}{7 - (5)} = \frac{0}{2} = 0$$

m =

$$(2, -3), (2, 8)$$

$$(-1, -3), (-2, -8)$$

Examples: Write the y-intercept and the slope (in 3 ways) for each line.

$$1) y = \frac{2}{3}x - 5$$

$$b = -5 \quad (0, -5)$$

$$m = \frac{2}{3} = \frac{-2}{-3} = 0.\overline{66}$$

$$2) y = -\frac{3}{5}x - 3$$

$$b = -3 \quad (0, -3)$$

$$m = -\frac{3}{5} = \frac{-3}{5} = \frac{3}{-5} = -0.6$$

$$3) y = 4x + 3$$

$$b = 3 \quad (0, 3)$$

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

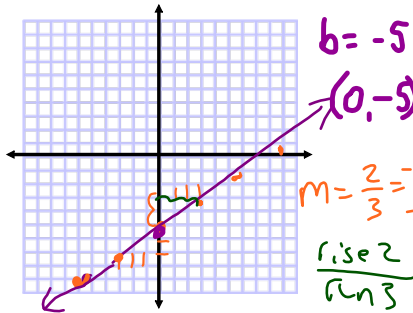
$$4) y = \frac{7}{6}x - 8$$

$$b = -8 \quad (0, -8)$$

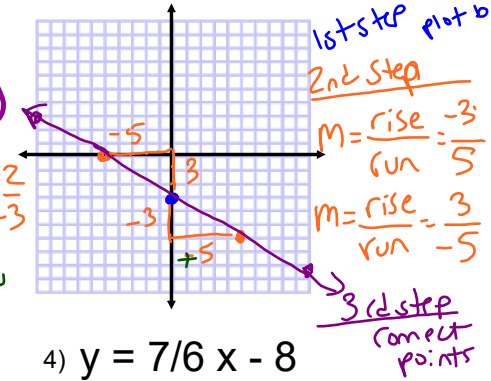
$$m = \frac{7}{6} = \frac{-7}{-6} = 1.\overline{16}$$

Graph each equation using slope and y intercept.

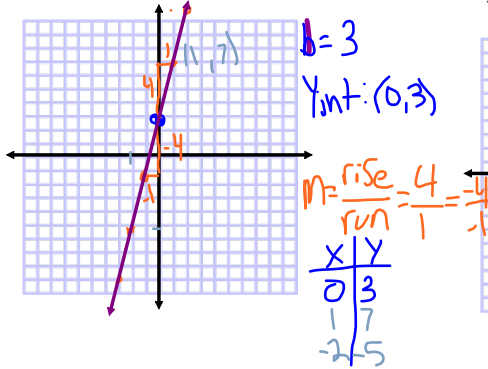
1) $y = \frac{2}{3}x - 5$



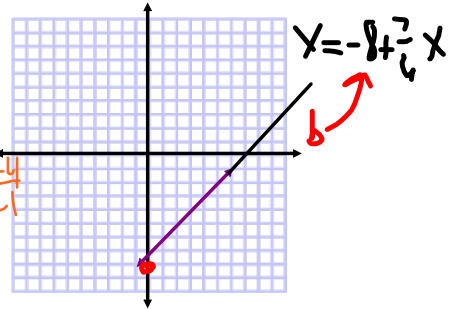
2) $y = -\frac{3}{5}x - 3$



3) $y = 4x + 3$



4) $y = \frac{7}{6}x - 8$



Given a
Table or
Graph

$y = mx + b$

Need slope, need y-intercept

Problem #	Table of values (x,y)	Equation (y = mx + b form)	Graph												
1.)	<table border="1"> <tr><td>x</td><td>y</td></tr> <tr><td>-2</td><td></td></tr> <tr><td>-1</td><td>-1</td></tr> <tr><td>0</td><td>1</td></tr> <tr><td>1</td><td></td></tr> <tr><td>2</td><td>5</td></tr> </table>	x	y	-2		-1	-1	0	1	1		2	5		
x	y														
-2															
-1	-1														
0	1														
1															
2	5														
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x	y														
0	-4														
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-2	-3														
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2	5														
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x	y														
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4.)	<table border="1"><thead><tr><th>x</th><th>y</th></tr></thead><tbody><tr><td>-5</td><td>4</td></tr><tr><td>0</td><td>0</td></tr><tr><td>5</td><td>-4</td></tr></tbody></table>	x	y	-5	4	0	0	5	-4	$y = -4/5x + 0$ $m = \frac{-4}{5} = -\frac{4}{5}$					
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x	y														
6	1														
4	-1														
0	-5														
1	-4														
2	-3														
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