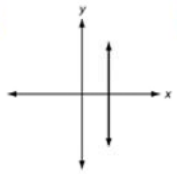
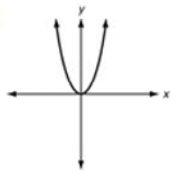
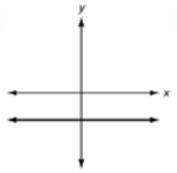
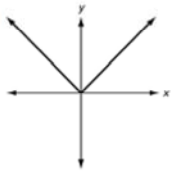
Warm-up 9/24

1. Which of the following is a linear function?

A 

C 

B 

D 

2. What is the x-intercept of $4x + 2y = 6$?

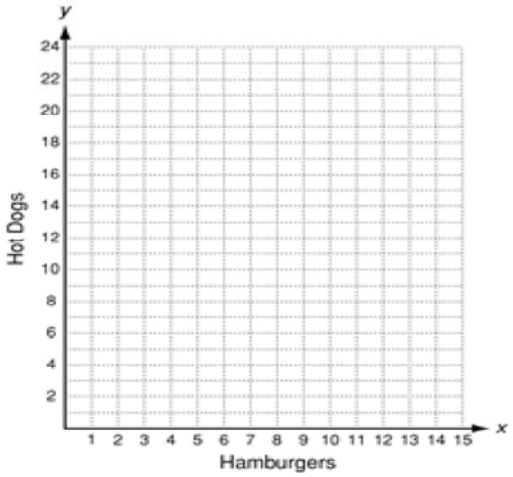
F $\frac{1}{3}$ H $\frac{3}{2}$

G $\frac{2}{3}$ J 3

3. At a fair, hamburgers sell for \$3.00 each and hot dogs sell for \$1.50 each. The equation $3x + 1.5y = 30$ describes the number of hamburgers and hot dogs a family can buy with \$30.

a. Find the intercepts and graph the function.

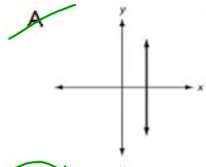
b. What does each intercept represent?



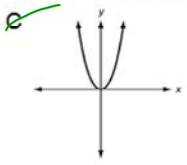
Warm-up 9/23

1. Which of the following is a linear function?

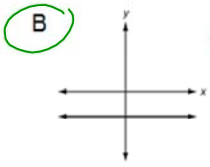
A



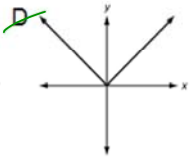
C



B



D



2. What is the x-intercept of $4x + 2y = 6$?

F $\frac{1}{3}$

G $\frac{2}{3}$

H $\frac{3}{2}$

J 3

$4x + 2(0) = 6$

$\frac{4x}{4} = \frac{6}{4}$

$x = 3/2$

3. At a fair, hamburgers sell for \$3.00 each and hot dogs sell for \$1.50 each. The equation $3x + 1.5y = 30$ describes the number of hamburgers and hot dogs a family can buy with \$30.

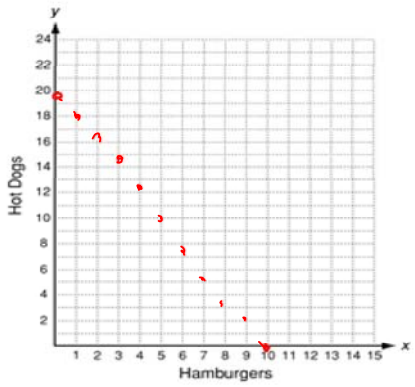
a. Find the intercepts and graph the function.

(10,0) (0,20)

b. What does each intercept represent?

10 maximum hamburgers

20 maximum hotdogs



$3x + 1.5(0) = 30$

$\frac{3x}{3} = \frac{30}{3}$

$x = 10$

$3(0) + 1.5y = 30$

$\frac{1.5y}{1.5} = \frac{30}{1.5}$

$y = 20$

Any homework or other questions before the quiz?

https://goo.gl/forms/W47iP0YdY9oFJsG93

Section 4.3

Today's Goals

I can

- relate a constant rate of change to the slope of a line.
- write linear equations (point-slope and slope-intercept forms)

Once upon a

Talk it Out

Talk with a partner. Was there a time when you experienced a very steep hill? Maybe your experience involved a bicycle, skis, a car, etc.. Talk about your experience with your partner. Why does steepness matter? How might this connect with linear equations? Be prepared to share your story with the class.

Section 4.3: Rate of Change

A **rate of change** is a ratio that compares the amount of change in a dependent variable to the amount of change in an independent variable.

Rate of change = $\frac{\text{rise}}{\text{run}} = \frac{\text{dependent}}{\text{independent}} = \text{slope} = \frac{\Delta y}{\Delta x}$

Finding Rate of Change from a table

The table shows the average temperature (°F) for five months in a certain city. Find the rate of change for each time period. During which time period did the temperature increase at the fastest rate? months 5-7

Step 1 Identify the dependent and independent variables.

Month	2	3	5	7	8
Temp. (°F)	56	56	63	71	72

ind

dep

Step 2 Find the rates of change.

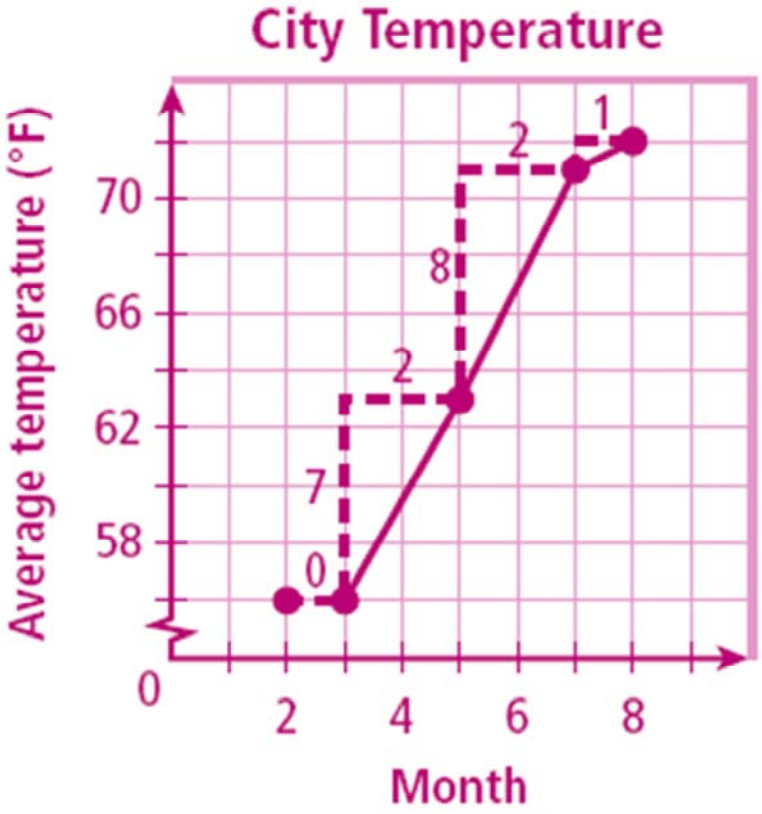
$\frac{0}{1}, \frac{7}{2}, \frac{8}{2}, \frac{1}{1}$

0, 3.5, 4, 1

Finding Rate of Change from a Graph

Graph the data from Example 1 and show the rates of change.

Month	2	3	5	7	8
Temp. (°F)	56	56	63	71	72



Graph the ordered pairs. The vertical segments show the changes in the dependent variable, and the horizontal segments show the changes in the independent variable.

Notice that the greatest rate of change is represented by the steepest of the red line segments.

Also notice that between months 2 to 3, when the balance did not change, the line segment is horizontal.

Try This!

The table shows the balance of a bank account on different days of the month. Find the rate of change during each time interval. During which time interval did the balance decrease at the greatest rate?

Day	1	6	16	22	30
Balance ($)	550	285	210	210	175

Try This!

The table shows the balance of a bank account on different days of the month. Find the rate of change during each time interval. During which time interval did the balance decrease at the greatest rate? days 1-6

Day	1	6	16	22	30
Balance ($)	550	285	210	210	175

5 10 6 8

-265 -75 0 -35

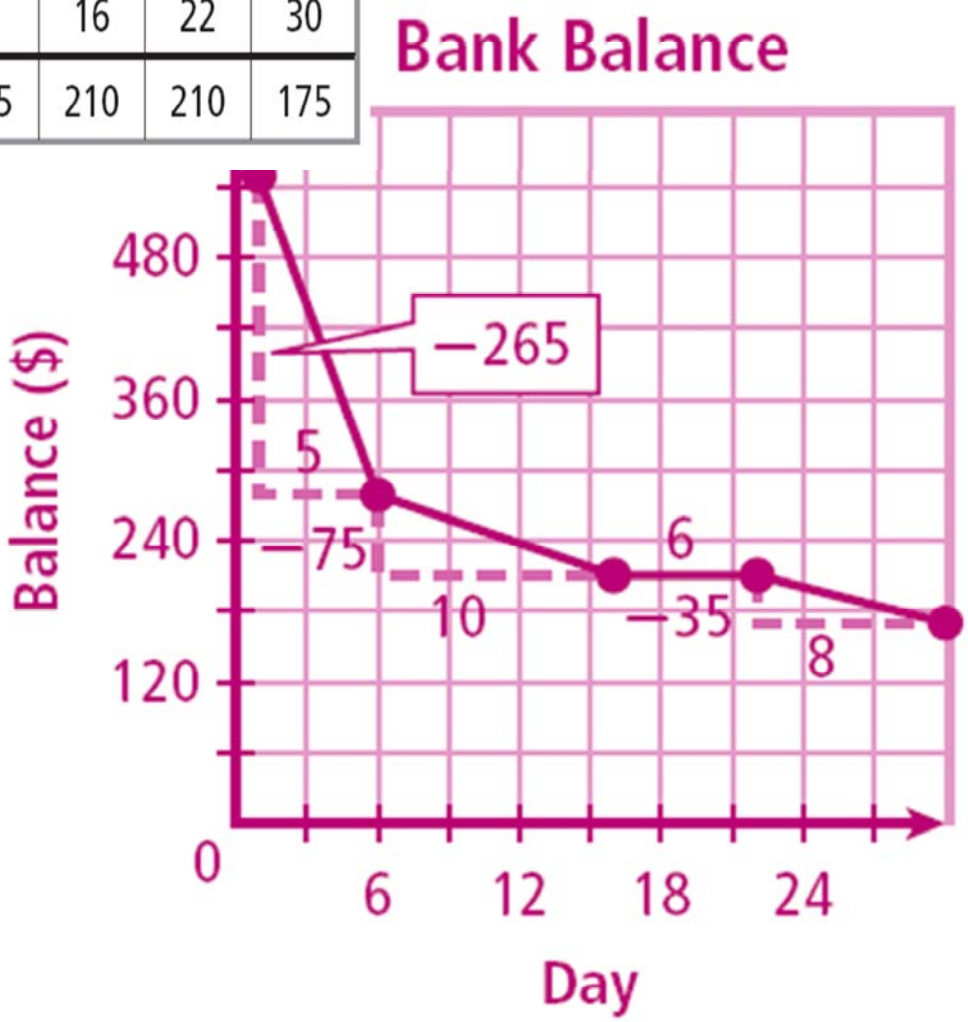
$\frac{-265}{5}, \frac{-75}{10}, \frac{0}{6}, \frac{-35}{8}$

-53, -7.5, 0, -4.375 decrease in $ per day

Try This!

Graph the data from Example 2 "Try T… rates of change.

Day	1	6	16	22	30
Balance ($)	550	285	210	210	175



If all of the connected segments have the same rate of change, then they all have the same steepness and together form a straight line. The constant rate of change of a line is called the ***slope*** of the line.

Slope of a Line

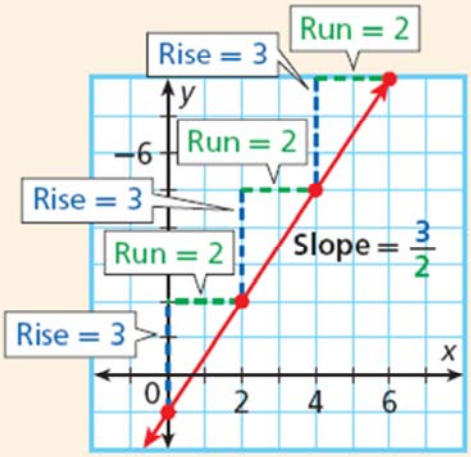
The **rise** is the difference in the *y*-values of two points on a line.

The **run** is the difference in the *x*-values of two points on a line.

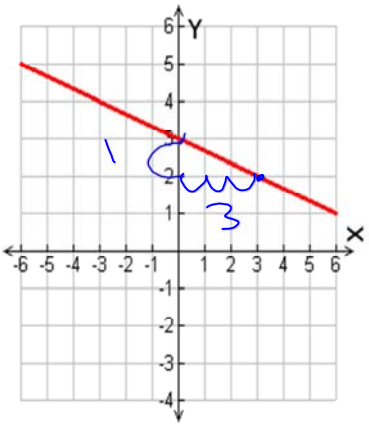
The **slope** of a line is the ratio of rise to run for any two points on the line.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x}$$

(Remember that *y* is the dependent variable and *x* is the independent variable.)



Finding Slope of a Line

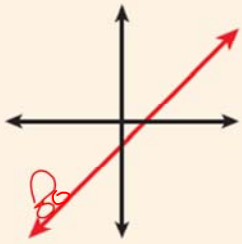
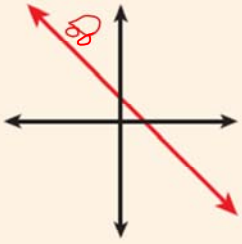
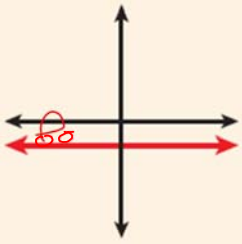
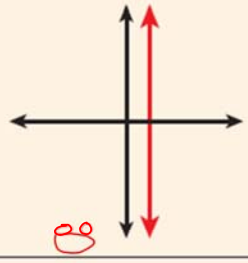


$-\frac{1}{3}$

Begin at one point and count vertically to find the rise.

Then count horizontally to the second point to find the run.

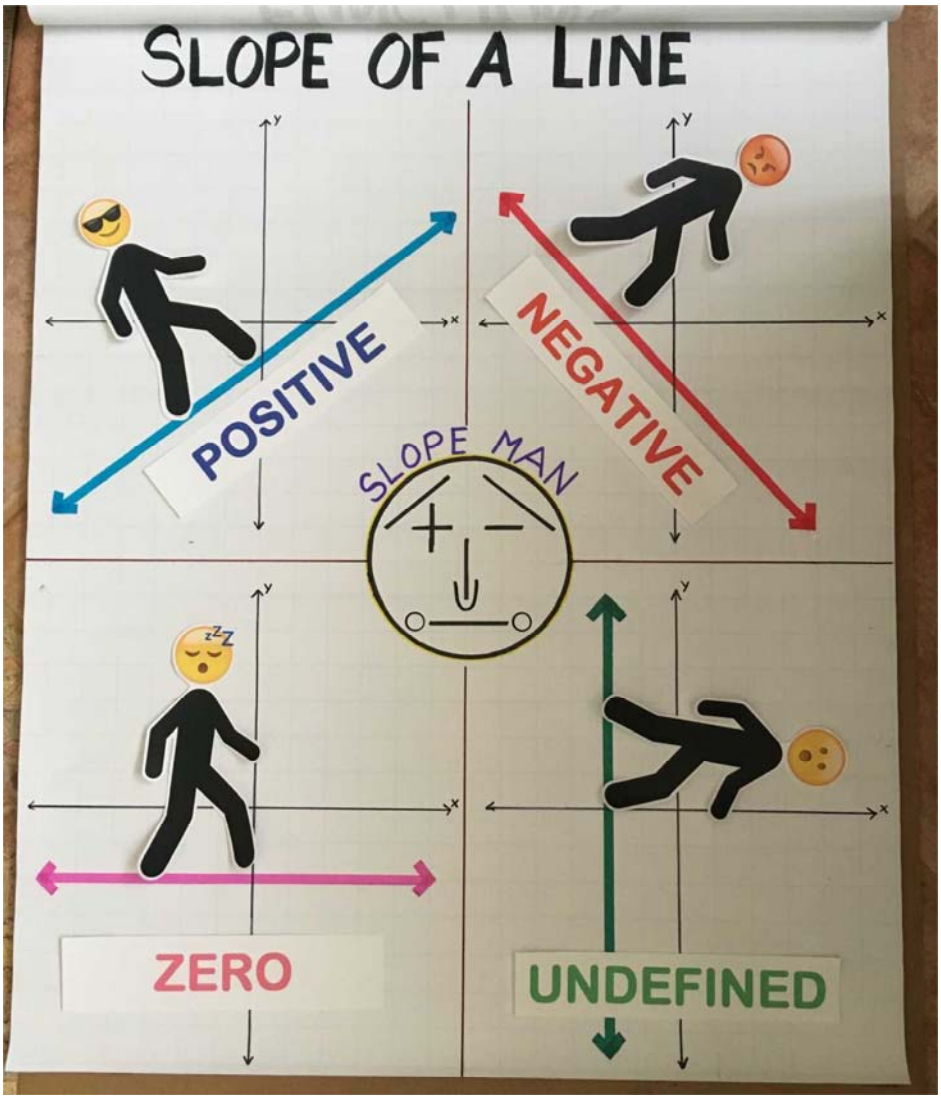
Classifying Slope

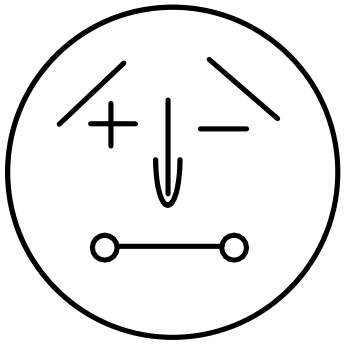
Positive Slope	Negative Slope	Zero Slope	Undefined Slope
			
Line rises from left to right.	Line falls from left to right.	Horizontal line	Vertical line

Negative Slope

Zero Slope

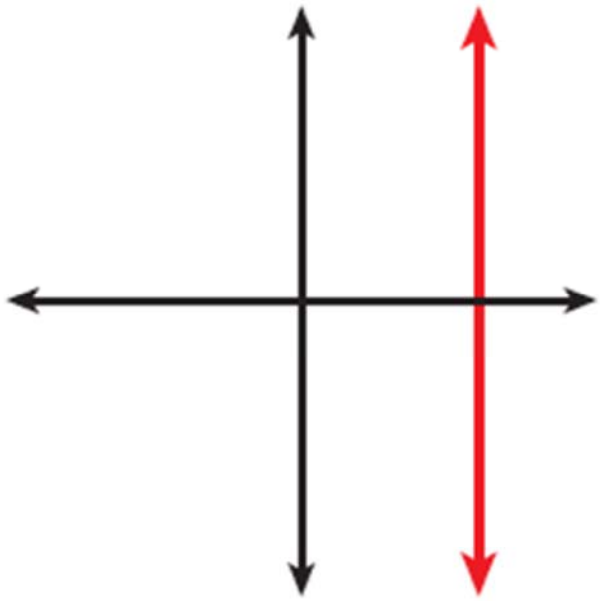
No Slope

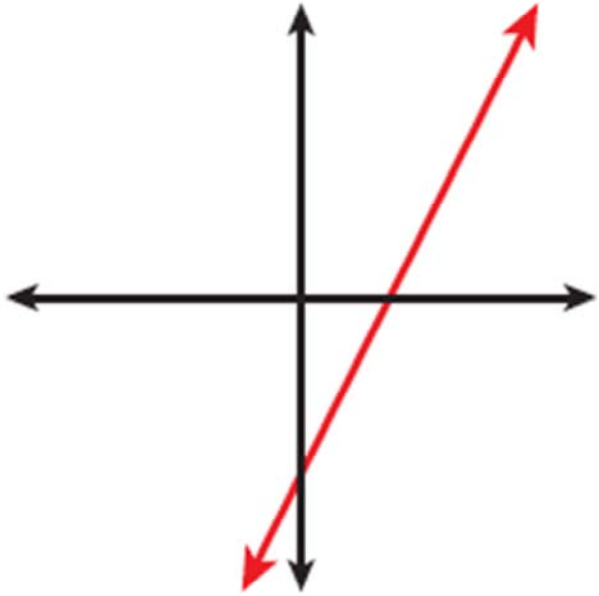

SLOPE OF A LINE
POSITIVE
NEGATIVE
SLOPE MAN
ZERO
UNDEFINED

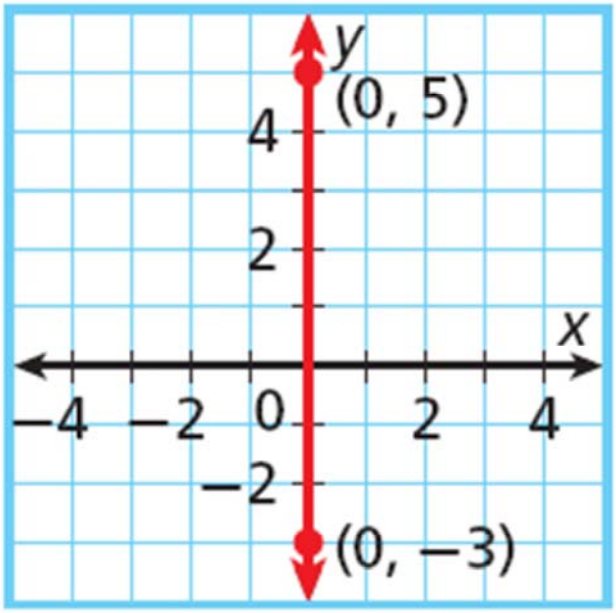


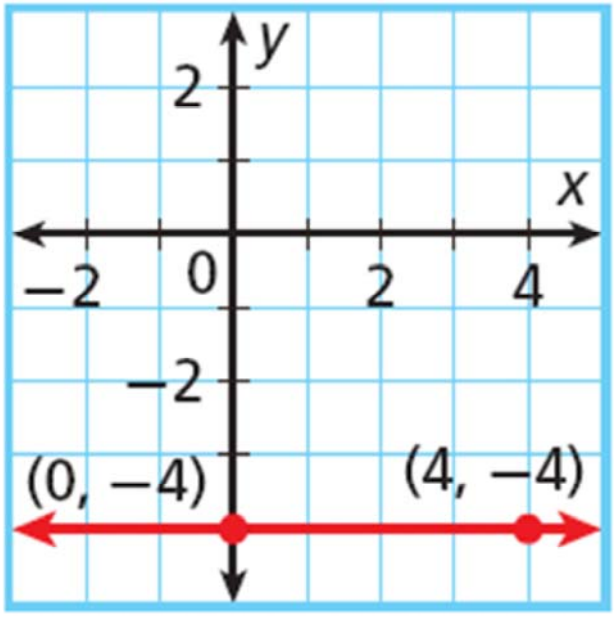
Try This!

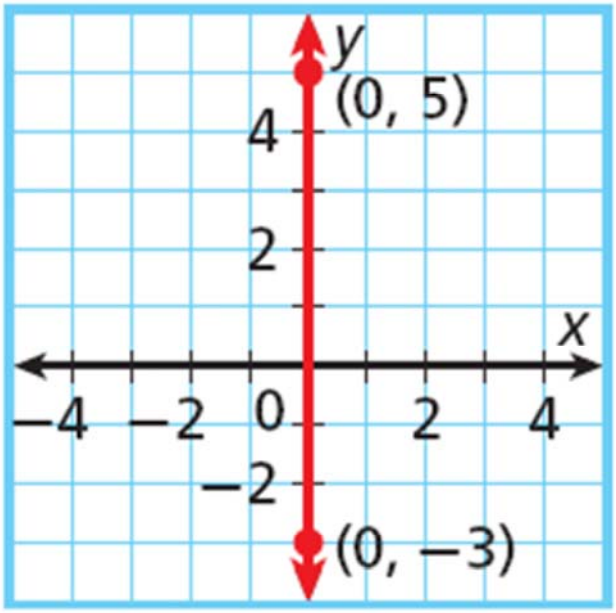
Tell whether the slope of each line is positive, negative, zero or undefined.

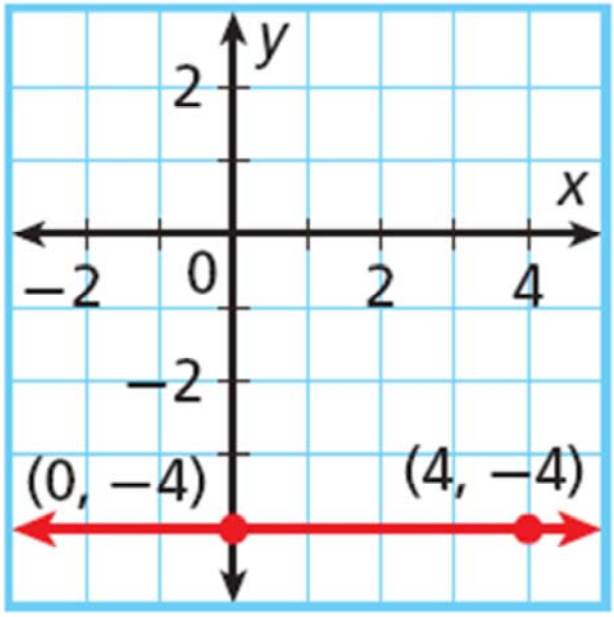





y
(0, 5)
4
2
x
−4
−2
0
2
4
−2
(0, −3)

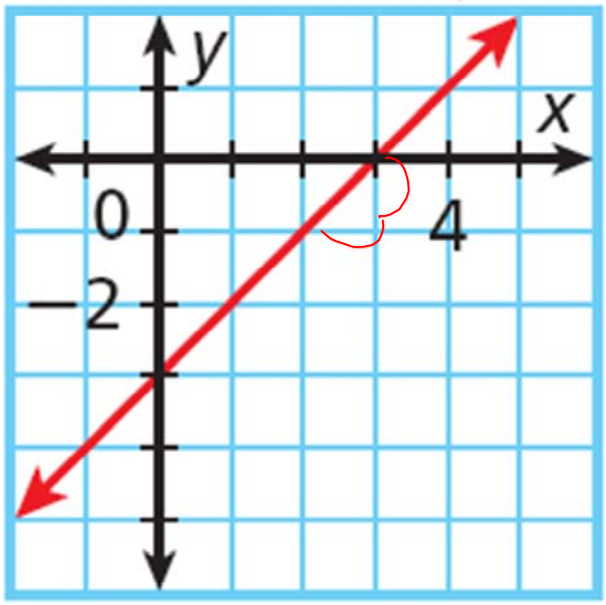

y
2
x
−2
0
2
4
−2
(0, −4)
(4, −4)

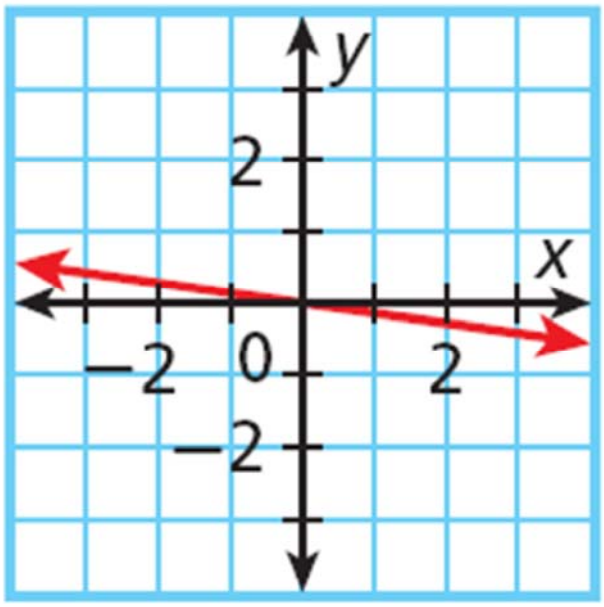

y
(0, 5)
4
2
x
−4
−2
0
2
4
−2
(0, −3)


y
2
x
−2
0
2
4
−2
(0, −4)
(4, −4)

Describing Slope

Tell whether the slope of each line is positive, negative, zero or undefined. $\frac{1}{1} = 1$





Section 4.4: The Slope Formula

There is also a formula you can use to find the slope of a line, which is usually represented by the letter ***m***. To use this formula, you need the coordinates of **two different points** on the line.

Slope Formula

WORDS	FORMULA	EXAMPLE
The slope of a line is the ratio of the difference in y-values to the difference in x-values between any two different points on the line.	If (x_1, y_1) and (x_2, y_2) are any two different points on a line, the slope of the line is $m = \frac{y_2 - y_1}{x_2 - x_1}$.	If $(2, -3)$ and $(1, 4)$ are two points on a line, the slope of the line is $m = \frac{4-(-3)}{1-2} = \frac{7}{-1} = -7$.

Find the slope of the line that contains (0, 3) and (-5, –5).

x_1, y_1 x_2, y_2

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \frac{(-5)-(3)}{(-5)-(0)} = \frac{-8}{-5} = \frac{8}{5}$$

Find the slope of the line that contains (0, 3) and (-5, –5).

$x_1, y_1 \quad x_2 \quad y_2$

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

$$m = \frac{-5-(3)}{-5-(0)} = \frac{-8}{-5} = \frac{8}{5}$$

X	Y
2	(-5, -5)
1	(-0, -3)

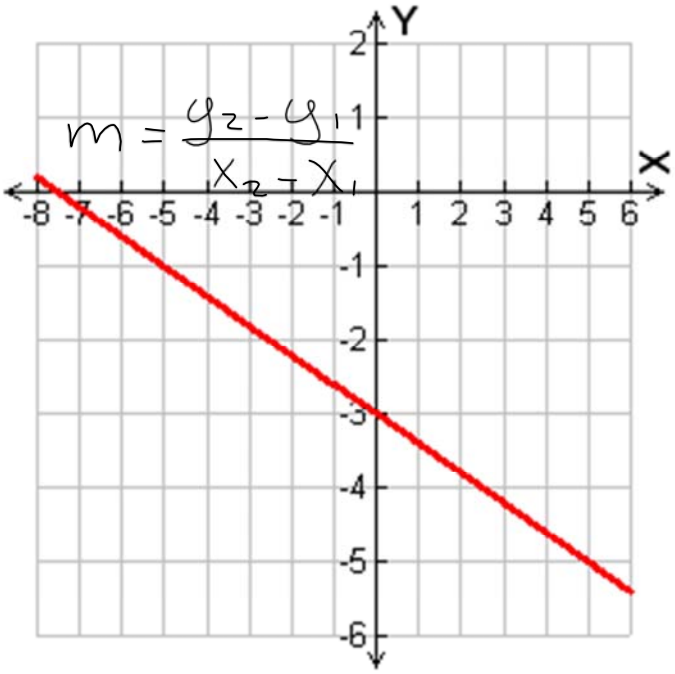
$\Delta x \quad \Delta y$

$-5 \quad -8$

$$\frac{-8}{-5} = \frac{8}{5}$$

Try This!

Find the slope of the line that contains (0, −3) and (5, −5).

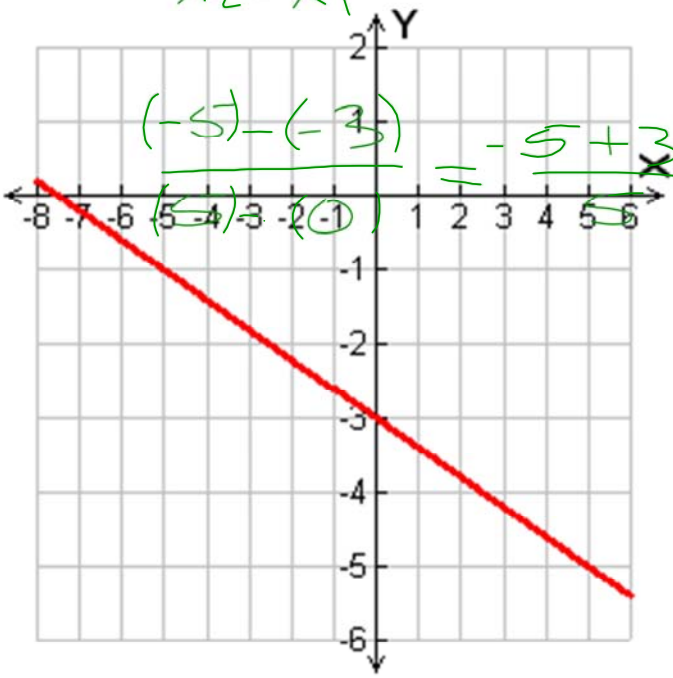


Try This!

Find the slope of the line that contains (0, –3) and (5, –5).

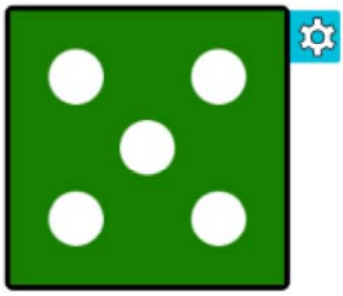
x_1 y_1 x_2 y_2

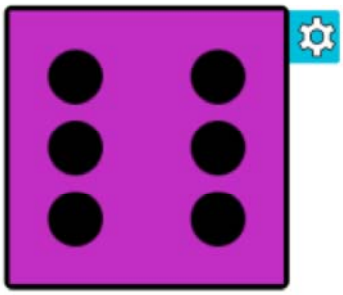
$m = \frac{y_2 - y_1}{x_2 - x_1}$



$\frac{(-5)-(-3)}{(-5)-0} = \frac{-5+3}{-5} = \frac{-2}{-5}$

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





x_1, y_1
$(4, 1)$
x_2, y_2
$(-5, 6)$

$(3, -6)$ $(1, 4)$

$m = -\frac{5}{9}$

$\frac{(6) - (1)}{(-5) - (4)} = -\frac{5}{9}$

Homework

Find the slope four times using the 8 points you found with the dice.