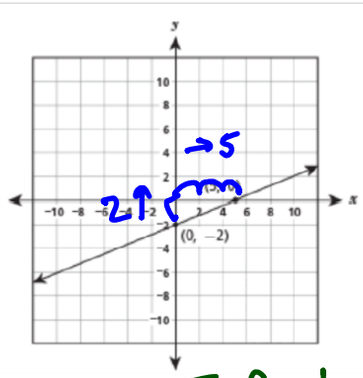
Name:_____ Date:_____

Notes: Rate of Change / Slope

Do Now:

In complete sentences, explain how to find the slope of the following line graphically and algebraically. Then find the slope of the line using each method.



Graphically

I first find two points on the line whose coordinates I know. I then start at the left-most point and find how many spaces up or down I must move to get to the other point and do the same for kft and right. From (0,-2) to (5,0) ↑2 →5 ∴ $\frac{2}{5}$

Algebraically

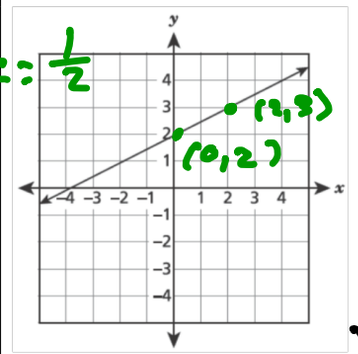
I first find two points on the line whose coordinates I know. I then use the rate of change formula, $\frac{y_2-y_1}{x_2-x_1}$, to find the line's rate of change.

(0,-2) (5,0)
(x_1,y_1) (x_2,y_2)

$\frac{y_2-y_1}{x_2-x_1} = \frac{0-(-2)}{5-0} = \frac{2}{5}$

Vocab Breakdown

Rate of Change/Slope: (also think speed)



$\frac{3-2}{2-0} = \frac{1}{2}$

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

These are all different ways of saying the same thing!

$y = mx + b$

↑ slope = m

Find the rate of change of each of the following relationships.

1) $(9, -1)$ *and* $(12, -8)$

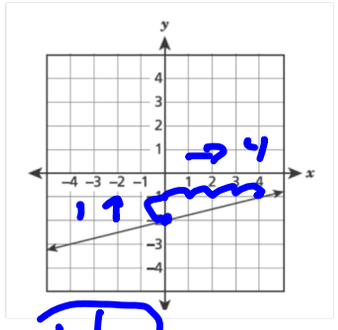
$x_1\ y_1 \quad x_2\ y_2$

$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-8-(-1)}{12-9} = \boxed{\frac{-7}{3}}$

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

$\boxed{m = \frac{2}{3}}$

3)



$\frac{\Delta y}{\Delta x} = \boxed{\frac{1}{4}}$

4) $-4y + 1 = 7x$

$-1 \quad -1$

$-4y = 7x - 1$

$y = \frac{-7}{4}x + \frac{1}{4}$

$\boxed{m = \frac{-7}{4}}$

5) A car traveling at a constant speed travels 165 miles in 3 hours and 385 miles in 7 hours. Find the car's speed by using both times.

$(3, 165) \quad (7, 385)$

$x_1\ y_1 \quad x_2\ y_2$

$\frac{385 - 165}{7 - 3} = \frac{220}{4}$

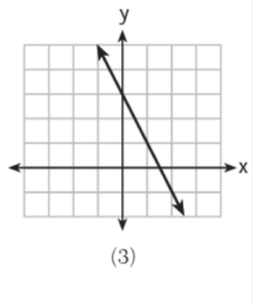
$\boxed{55 \text{ miles per hour}}$

Before The Classwork:

Which function has a constant rate of change equal to −3?

x	y
0	2
1	5
2	8
3	11

(1)



(3)

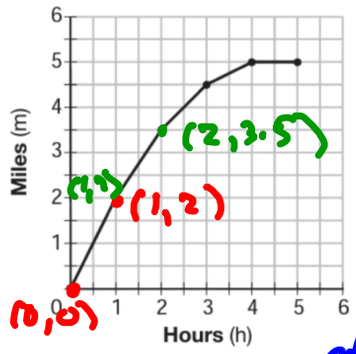
{(1,5), (2,2), (3,−5), (4,4)}

(2)

$2y = -6x + 10$

(4)

The graph below shows the distance in miles, m, hiked from a camp in h hours.



Which hourly interval had the greatest rate of change?

(1) hour 0 to hour 1
(2) hour 1 to hour 2
(3) hour 2 to hour 3
(4) hour 3 to hour 4

An astronaut drops a rock off the edge of a cliff on the Moon. The distance, y, in meters, the rock travels after x seconds can be modeled by the equation $y = 0.8x^2$. What is the average speed, in meters per second, of the rock between 5 and 10 seconds after it is dropped?

(1) 12
(2) 20
(3) 60
(4) 80

Name:_____ Date:_____

Classwork: Rate of Change / Slope

Find the slope of each relationship.

1) $y = -7x + 9$

$m = -7$

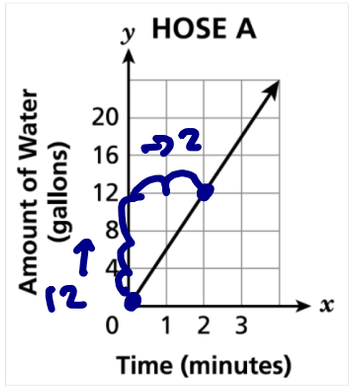
2) $(-3,-5)$ $(-9,12)$

$x_1\ y_1\ \ x_2\ y_2$

$$\frac{12 + (+5)}{-9 + (+3)}$$

$$\frac{17}{-6}$$

3)



$\frac{\uparrow 12}{\rightarrow 2}$ $\frac{12}{2} = 6$

6 gallons/minute

4) $3x - 11y = 88$

$-3x \quad -3x$

$$\frac{-11y}{-11} = \frac{-3x + 88}{-11}$$

$y = \frac{3}{11}x - 8$

$m = \frac{3}{11}$

5) ***Line 1*** passes through the points (12,-13) and (-4,-1). A line formed from which of the following points has the same slope as ***Line 1***. $x_1\ y_1$ $x_2\ y_2$

$$\frac{-1 + (+13)}{-4 + 12} = \frac{12}{-16} = -\frac{3}{4}$$

A $(1,3)$ *and* $(13,12)$

B $(-2,5)$ *and* $(13,25)$

C $(-9,5)$ *and* $(-1,-1)$

D $(0,0)$ *and* $(8,7)$

↳ $\frac{-1-5}{-1+(-9)} = \frac{-6}{8} = \frac{-3}{4}$

6)

The table below shows the cost of different numbers of goldfish at a pet store.

COST OF GOLDFISH

Number of Goldfish	Cost
5	$1.50
10	$3.00
15	$4.50
20	$6.00

The cost is a linear function of the number of goldfish. Which statement describes the rate of change of this function?

A The cost increases $0.30 each time 1 goldfish is added.

B The cost increases $1.50 each time 1 goldfish is added.

C The cost increases $3.00 each time 5 goldfish are added.

D The cost increases $6.00 each time 5 goldfish are added.

7) ***Line 2*** has a slope that is twice the slope of ***Line 1***. ***Line 1*** passes through the points (5,6) and (15,21). What is the slope of ***Line 2***?

A 0.75

B 1.5

C 3

D 6

8)

The table below shows the cost of mailing a postcard in different years. During which time interval did the cost increase at the greatest average rate?

Year	1898	1971	1985	2006	2012
Cost (¢)	1	6	14	24	35

(1) 1898–1971

(2) 1971–1985

(3) 1985–2006

(4) 2006–2012

9)

A company that manufactures radios first pays a start-up cost, and then spends a certain amount of money to manufacture each radio. If the cost of manufacturing r radios is given by the function $c(r) = 5.25r + 125$, then the value 5.25 best represents

(1) the start-up cost

(2) the profit earned from the sale of one radio

(3) the amount spent to manufacture each radio

(4) the average number of radios manufactured

10)

The table below shows the average diameter of a pupil in a person's eye as he or she grows older.

Age (years)	Average Pupil Diameter (mm)
20	4.7
30	4.3
40	3.9
50	3.5
60	3.1
70	2.7
80	2.3

$\frac{2.3-4.7}{80-20} = \frac{-2.4}{60}$

What is the average rate of change, in millimeters per year, of a person's pupil diameter from age 20 to age 80?

(1) 2.4

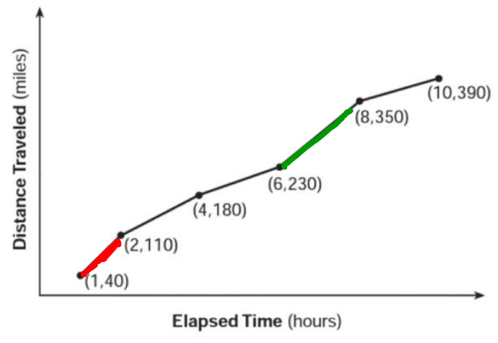
(2) 0.04

(3) −2.4

(4) −0.04

11)

The Jamison family kept a log of the distance they traveled during a trip, as represented by the graph below.



$\frac{110-40}{2-1} = 70$

$\frac{350-230}{8-6} = \frac{120}{2} = 60$

During which interval was their average speed the greatest? — steepest

(1) the first hour to the second hour

(2) the second hour to the fourth hour

(3) the sixth hour to the eighth hour

(4) the eighth hour to the tenth hour