

Unit 4: Day 2 Notes

Name: _____

Objective: I can find rates of change

When the data points form a linear function, the rate of change is constant. This rate of change is the ratio of the vertical change (or rise) to the horizontal change (or run) between two points on the line called the slope of the line.

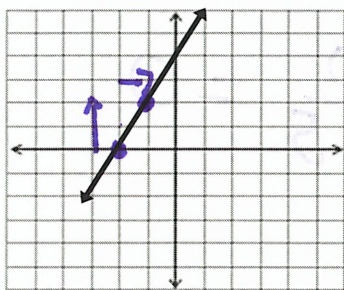
$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}}$$

\times slope = m

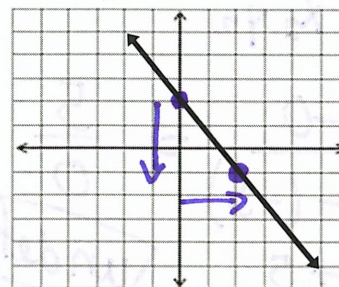
Find the slope of each line:

positive slope - increasing

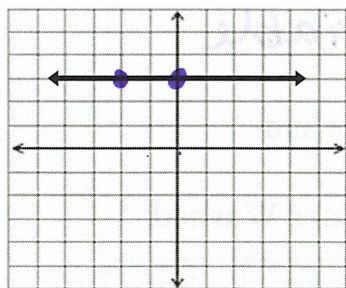
negative slope - decreasing



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

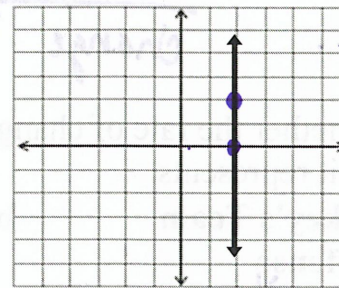


$$m = -\frac{3}{2}$$



$y = 3$
 $m = \frac{0}{2}$

$$m = 0$$



$$m = \frac{2}{0}$$

$x = 2$
can't divide by zero
 $m = \text{undefined}$

A horizontal line has a slope of zero. $y = \#$

A vertical line has a slope that is undefined. $x = \#$

Slope formula: Given the two points (x_1, y_1) and (x_2, y_2) :

$$\text{Slope: } \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}, \text{ where } x_2 - x_1 \neq 0$$

Find the slope of the line that passes through each pair of points.

1.) $(3, 8), (7, 3)$
 $x_1 \ y_1 \ x_2 \ y_2$

$$m = \frac{3 - 8}{7 - 3} = \frac{-5}{4}$$

2.) $(8, -4), (-6, -3)$
 $x_1 \ y_1 \ x_2 \ y_2$

$$m = \frac{-3 - (-4)}{-6 - 8} = \frac{-3 + 4}{-6 - 8} = \frac{1}{-14}$$

3.) $(-5, 0), (-5, 5)$
 $x_1 \ y_1 \ x_2 \ y_2$

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

undefined

4.) $(3, 8), (-2, 8)$
 $x_1 \ y_1 \ x_2 \ y_2$

$$m = \frac{8 - 8}{-2 - 3} = \frac{0}{-5} = 0$$

Rate of change =

r.o.c.

"y"
change in dependent variable
 change in independent variable
 "x"

Determine whether the rate of change is constant. Find the rate of change and explain what it represents.

a) Hockey's Team

b) Miles per Gallon

c) Cars Washed

Offense

Games	Goals
1	2
2	4
3	6

(Handwritten: +1 for Games, +2 for Goals)

Gallons	Miles
1	28
3	84
5	140
7	196

(Handwritten: +2 for Gallons, +56 for Miles)

Hours	Cars
1	4
2	8
3	12
4	16

(Handwritten: +1 for Hours, +4 for Cars)

yes

$$\text{rate of change} = \frac{2}{1}$$

2 goals scored per game

yes

$$\text{r.o.c} = \frac{56}{2}$$

$$\text{r.o.c} = \frac{28}{1}$$

28 miles per gallon

yes

$$\text{r.o.c} = \frac{4}{1}$$

4 cars washed per hour

State the independent variable and dependent variable, then find the rate of change for each situation.

1) The cost of three gallons of milk is \$8.85 and five gallons of milk is \$14.75.

independent = $\overset{x}{\# \text{ of gallons}}$, dependent = $\overset{y}{\text{price per gallon}}$,
 rate = $\frac{14.75 - 8.85}{5 - 3} = \frac{5.9}{2} = \frac{2.95}{1}$ \$2.95 per gallon

2) Jack filled 20 envelopes in 2 minutes and 100 envelopes in 10 minutes.

independent = mins , dependent = envelopes ,
 rate = $\frac{100 - 20}{10 - 2} = \frac{80}{8} = \frac{10}{1}$ 10 envelope per min

Without graphing, tell whether the slope of the line that models each linear relationship is positive, negative, zero, or undefined. Then find the slope.

a) The cost of a pair of jeans is \$22.50 for 1 pair, and \$67.50 for 3 pairs.

positive slope $m = 22.50$

b) A student earns a 95 on a test for answering one question wrong, and earns a 75 for answering five questions wrong.

negative $m = \frac{95 - 75}{1 - 5} = \frac{20}{-4} = \frac{-5}{1}$ 5 pts per question wrong

c) A semi driver sets his cruise control at 70 mph for 3 hours.

zero $m = 0$

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Handwritten notes at the bottom of the page, including the word "Lecture 3" and other illegible text.