

A green gradient banner with the word 'CHAPTER' in a vertical font on the left, a large number '3' in the center, and the text 'Linear Functions' to the right of the '3'.

Explore the new chapter syllabus.

A blue gradient banner with the word 'LESSON' in a vertical font on the left, the text '3-3' in the center, and 'Rate of Change and Slope' to the right of '3-3'.

Target 3-1

I can... find the slope and the rate of change
interpret it in the context of problem.

Example: Find the slope of the line through the two points $(-1, 3)$ and $(2, 2)$.

Journals: After rating your current knowledge write about the following in as much detail as possible:

Discuss what you know about solving equations. For example, what is an equation, what kinds can you solve, how do the steps differ when they look different, how do you know when you are right?

Ch 3 Linear Functions

Vocabulary to know and love:

linear function → Functions whose graph is a line.

rate of change

slope

x-intercept

y-intercept

independent variable

dependent variable

Rate of Change is a ratio that describes, on average, how much one quantity changes with respect to a change in another quantity.

If x is the independent variable and y is the dependent variable, then

$$\text{rate of change} = \frac{\text{change in } y}{\text{change in } x}$$

DRIVING TIME Use the table to find the rate of change. Explain the meaning of the rate of change.

rate of change = $\frac{\text{change in } y}{\text{change in } x}$

= $\frac{\text{change in distance}}{\text{change in time}}$

Time Driving (h)	Distance Traveled (mi)
x	y
2	76
4	152
6	228

$$\frac{152 - 76}{4 - 2} = \frac{76 \text{ miles}}{2 \text{ hrs}} = 38 \text{ miles/hr}$$

Answer: The rate of change is $\frac{38}{1}$. This means the car is traveling at a rate of 38 miles per hour.

Whiteboards!

CELL PHONE The table shows how the cost changes with the number of minutes used. Use the table to find the rate of change. Explain the meaning of the rate of change.

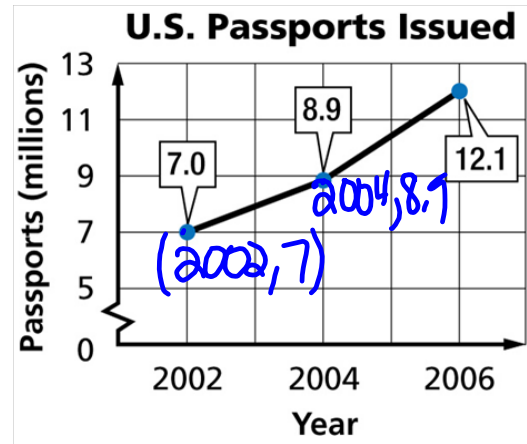
Minutes Used	Cost (\$)
x	y
20	1
40	2
60	3

$\frac{\text{change in } y}{\text{change in } x}$

Rate of change is $\frac{0.05}{1}$. This means that it costs \$0.05 per minute to use the cell phone.

A. TRAVEL The graph shows the number of U.S. passports issued in 2002, 2004, and 2006. Find the rates of change for 2002–2004 and 2004–2006.

$$\frac{\text{millions of passports}}{\text{change in quantity}} \\ \frac{\text{change in time}}{\text{years}}$$



$$\frac{8.9 - 7 \text{ million passports}}{2004 - 2002 \text{ years}}$$

$$\frac{1.9 \text{ million passports}}{2 \text{ years}}$$

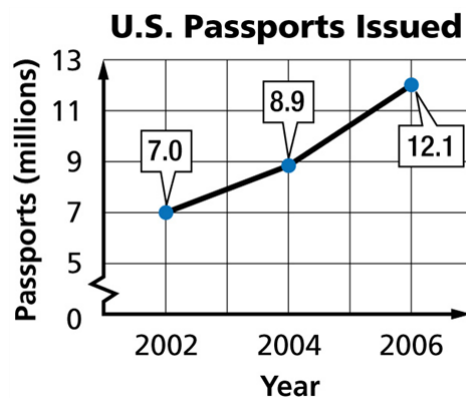
$$\frac{.95 \text{ million passports}}{1 \text{ year}}$$

Answer: The number of passports issued increased by 1.9 million in a 2-year period for a rate of change of 950,000 per year.

Answer: Over this 2-year period, the number of U.S. passports issued increased by 3.2 million for a rate of change of 1,600,000 per year.

B. Explain the meaning of the rate of change in each case.

For 2002–2004, there was an average annual increase of 950,000 in passports issued. Between 2004 and 2006, there was an average yearly increase of 1,600,000 passports issued.

C. How are the different rates of change shown on the graph?

Constant Rate of Change**A. Determine whether the function is linear. Explain.**

x	y
1	6
2	12
3	18
4	24

$$\frac{\text{changing } y}{\text{change in } x}$$

$$\frac{6}{1}$$

Answer: The rate of change is constant. Thus, the function is linear.**B. Determine whether the function is linear. Explain.**

x	y
-10	5
-2	1
6	-4
14	-10

$$\frac{4}{8}$$

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

The rate of change is not constant. Thus, the function is not linear.

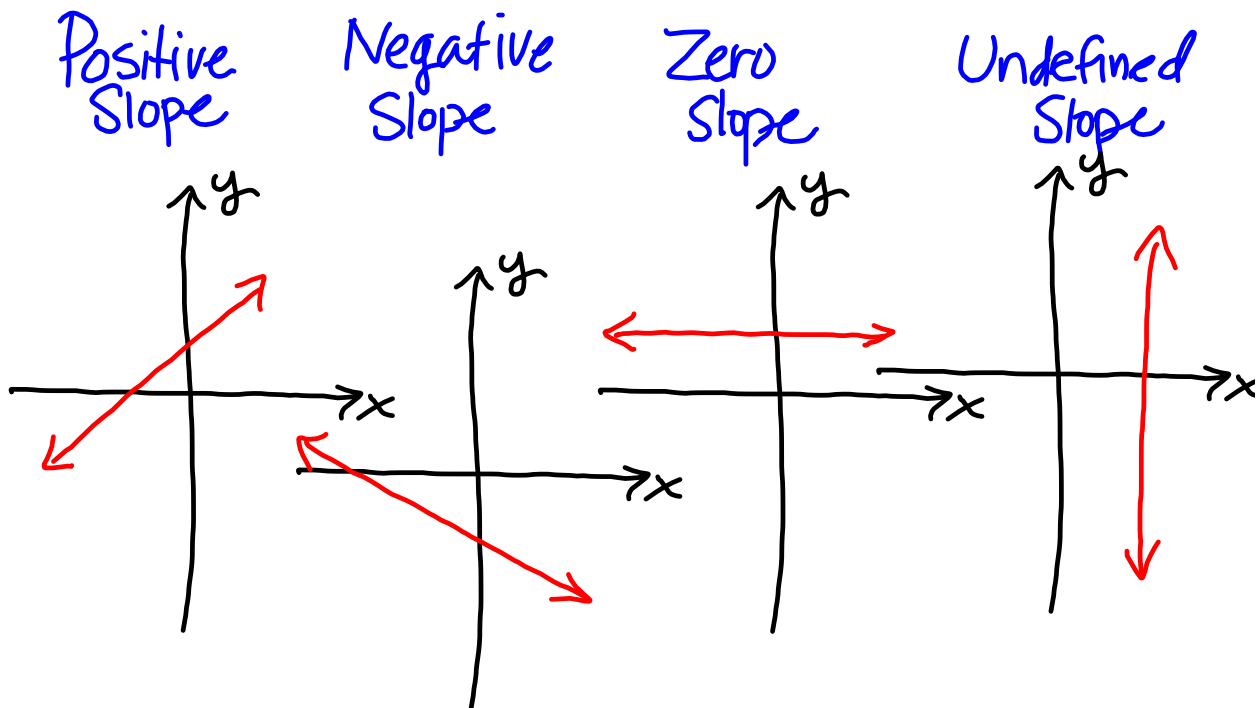
Determine whether the function is linear. Explain

A.

x	y
5	2
10	4
15	6
20	8

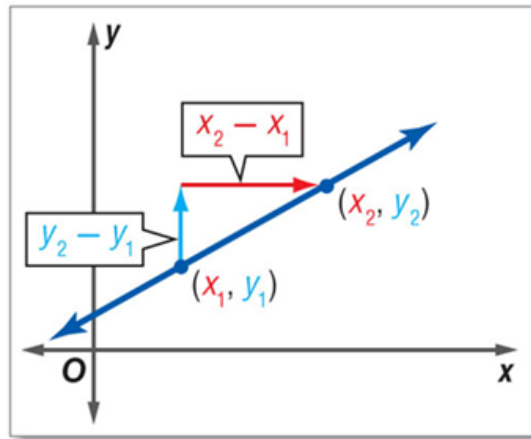
B.

x	y
3	12
6	16
12	20
15	24



$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

$$= \frac{\text{change in y-coordinates}}{\text{change in x-coordinates}}$$



8. Find the slope of the line that passes through

$(-3, 2)$ and $(5, 5)$.

x_1, y_1 x_2, y_2

$$\frac{\text{change in y's}}{\text{change in x's}} = \frac{2-5}{-3-5} = \frac{-3}{-8} = \frac{3}{8}$$

$$\boxed{\text{slope} = \frac{3}{8}}$$

9. Find the slope of the line that passes through

$(-3, -4)$ and $(-2, -8)$.

$x_1 \ y_1$ $x_2 \ y_2$

$$\frac{\text{chg } y\text{'s}}{\text{chg } x\text{'s}} = \frac{-4 - (-8)}{-3 - (-2)} = \frac{-4 + 8}{-3 + 2} = \frac{4}{-1} = -\frac{4}{1} = -\frac{4}{1}$$

$$\boxed{\text{slope} = -\frac{4}{1}}$$

all the same

Homework 3.3

Pg. 177

#15-35o, skip 19a, 42-45