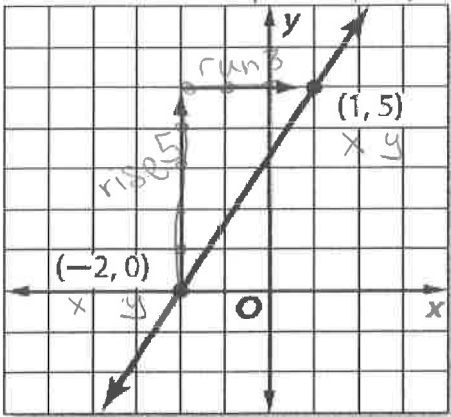
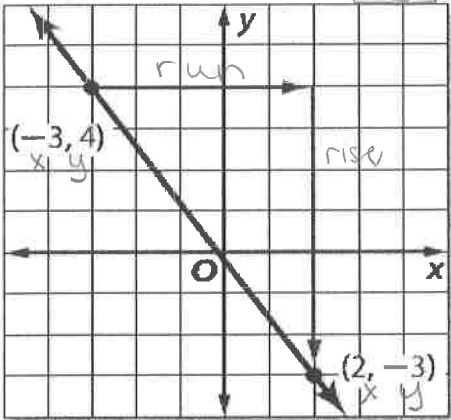


$\frac{\text{rise}}{\text{run}}$

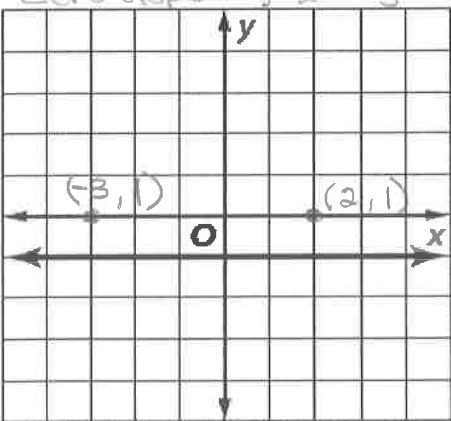
positive slope =  $\frac{5-0}{1-(-2)} = \frac{5}{3}$



negative slope =  $\frac{4-(-3)}{-3-2} = -\frac{7}{5}$



zero slope =  $\frac{1-1}{-3-2} = \frac{0}{-5} = 0$





\* Decimals for rates; no decimals in slopes.

### Ch. 3 Linear Functions

Algebra 1

Vocabulary to know and love:

11-1-13

- linear function - functions whose graph makes a line.
- rate of change
- slope
- x-intercept
- y-intercept
- independent variable
- dependent variable

Rate of change - 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.

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

$$\begin{aligned} \text{rate of change} &= \frac{\text{change in } y}{\text{change in } x} \\ &= \frac{\text{change in distance}}{\text{change in time}} \end{aligned}$$

$$\frac{\text{c. in d.}}{\text{c. in t.}} = \frac{152 - 76}{4 - 2} = \frac{76 \text{ miles}}{2 \text{ hrs}} = \boxed{\frac{38 \text{ miles}}{1 \text{ hr}}} \rightarrow \text{rate of change}$$

Answer: This means the car is traveling at a rate of 38 miles per hour.

Format of answer

The rate of change is \_\_\_\_\_  
 This means: . . .

② 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.

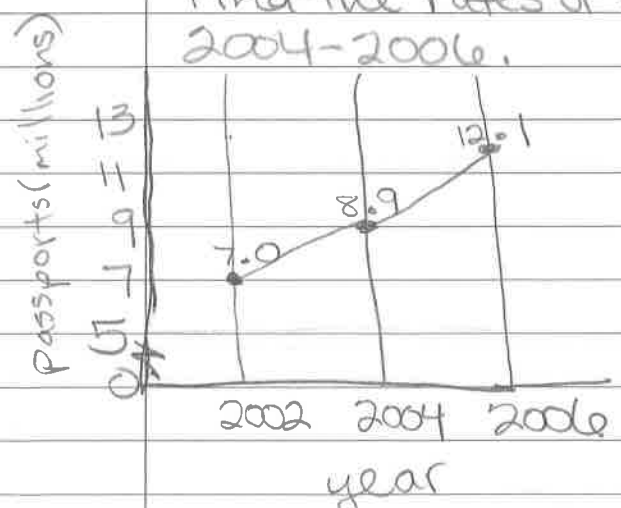
$$\frac{\text{change in } y}{\text{change in } x} = \frac{\text{change in cost}}{\text{change in minutes used}}$$

minutes used	cost
x	y
20	1
40	2
60	3

$\frac{42-1}{40-20} = \frac{1}{20}$   
 $\frac{\$0.05}{1 \text{ min}}$

It will cost \$.05 per minute to use the cell phone.

③ Travel: The graph shows the # of US Passports issued in 2002, 2004, and 2006. Find the rates of change for 2002-2004 and 2004-2006.



$$\frac{\text{change in } y}{\text{change in } x} = \frac{\text{change in millions of passports}}{\text{change in year}}$$

$$\frac{8.9 - 7.0 \text{ mill. pass.}}{2004 - 2002 \text{ years}} = \frac{1.9}{2} = 0.95$$

$$\frac{12.1 - 8.9 \text{ mill. pass.}}{2006 - 2004 \text{ years}} = \frac{3.2}{2} = 1.6$$

0.95 million passports and 1.6 million passports  
 1 year 1 year

1.9 million = 1,900,000      1.6 million = 1,600,000  
 0.95 million = 950,000

Alg 1  
11-1-13  
continued

<sup>2002-2004</sup>  
Answer: The number of passports issued increased by 1.9 million over 2 years for a rate of change of 950,000 per year.

<sup>2004-2006</sup>  
Answer: The number of passports issued increased by 3.2 million over 2 years for a rate of change of 1,600,000 per year.

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

A.

x	y
1	6
2	12
3	18
4	24

change in y = 6  
change in x = 1

Answer: The rate of change is constant.  
Thus, the function is linear.

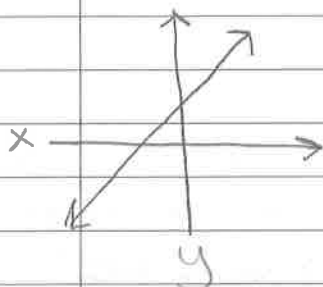
B.

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

$-\frac{4}{8}$ ,  $-\frac{5}{8}$ ,  $-\frac{6}{8}$

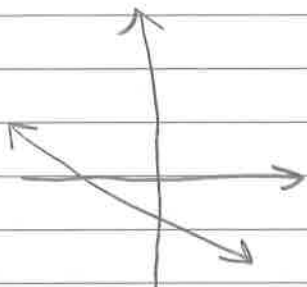
Answer: The rate of change is not constant.  
Thus, the function is not linear.

Positive  
Slope



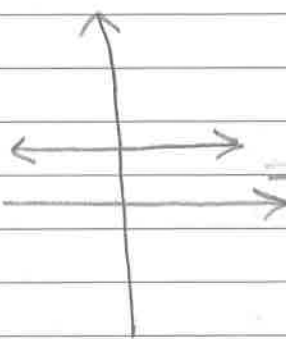
going  
up stairs  
from left  
to right

Negative  
Slope



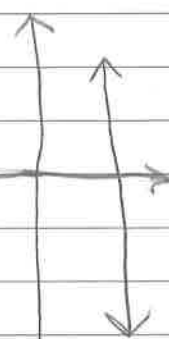
going down  
from left  
to right

Zero  
Slope



no slope  
horizontal

Undefined  
Slope



vertical

HW: pg 177 # 15-35 odd, skip 19a, 36-39, 42-45,  
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