GSE Algebra I Key Unit 7- Characteristics and Comparing 7.3 - Notes

Name: _____ Date: _____

Average Rate of Change

A ratio that describes how one quantity changes as another quantity changes.

We know it as slope = $\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x}$

Linear functions have a constant rate of change, meaning values increase or decrease at the same rate over a period of time.

Positive R.O.C:	Negative R.O.C:
increases over time 	decreases overtime 
Zero R.O.C:	**Undefined R.O.C:**
doesn't change overtime 	vertical 

Formula using function notation: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$

1. $f(x) = 2x^2 - 3$ from [2, 4].

$f(2) = 2(2)^2 - 3 = 5$ (x_1, y_1)

$f(4) = 2(4)^2 - 3 = 29$ (x_2, y_2)

(2,5) (4,29)

$m = \frac{29-5}{4-2} = \frac{24}{2} = 12$

2. $f(x) = -4x + 10$ from [-1, 3].

$f(-1) = -4(-1) + 10 = 14$

$f(3) = -4(3) + 10 = -2$

(-1,14) (3,-2)

$m = \frac{-2-14}{3-(-1)} = \frac{-16}{4} = -4$

3. a. Find the rate of change from day 1 to 2.

(1, 19) (2, 30)

$m = \frac{30-19}{2-1} = \frac{11}{1} = 11$

DAYS (X)	AMOUNT OF BACTERIA F(X)
1	19
2	30
3	48
4	76
5	121
6	192

b. Find the rate of change from day 2 to 5.

(2,30) (5,121)

$m = \frac{121-30}{5-2} = \frac{91}{3}$

4. In 2008, about 66 million U.S. households had both landline phones & cell phones. Find the rate of change from 2008 – 2011.

YEAR (X)	HOUSEHOLDS IN MILLIONS F(X)
2008	66
2009	61
2010	56
2011	51

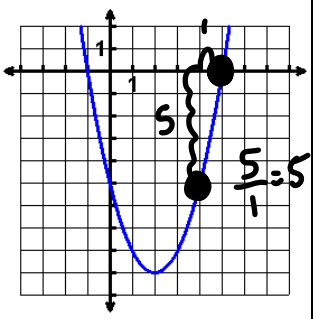
(2008, 66) (2011, 51)

$m = \frac{51-66}{2011-2008} = \frac{-15}{3} = -5$

What does this mean?

That the number of landlines is decreasing by 5 million per year.

5. a. Find the average rate of change from $0 \le x \le 1$



(0,-5) (1,-8)

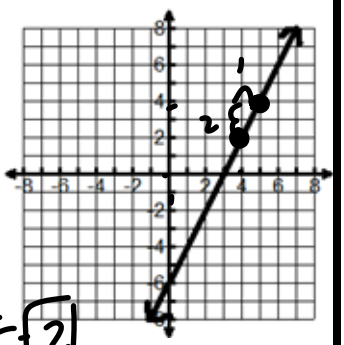
$m = \frac{-8-(-5)}{1-0} = \frac{-8+5}{1} = -3$

b. Find the average rate of change from $4 \le x \le 5$

(4,-5) (5,0)

$m = \frac{0-(-5)}{5-4} = \frac{5}{1} = 5$

5. Find the average rate of change from [0,1]



(0,-6) (1,-4)

$m = \frac{-4-(-6)}{1-0} = \frac{-4+6}{1} = 2$

b. Find the average rate of change from [4,5]

(4,2) (5,4)

$m = \frac{4-2}{5-4} = \frac{2}{1} = 2$

1. Find the rate of change of Pete's height from 3 to 5 years.

Time (years)	1	2	3	4	5	6
Height(in.)	27	35	37	42	45	49

(3, 37) (5, 45)
x_1 y_1 x_2 y_2

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{45-37}{5-3} = \frac{8}{2} = 4$

2. For $f(x) = -6x - 2$, find the rate of change on the interval [-2, 4].

$f(-2) = -6(-2) - 2 = 12 - 2 = 10$

$f(4) = -6(4) - 2 = -24 - 2 = -26$

(-2, 10) (4, -26)
x_1 y_1 x_2 y_2

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-26-10}{4-(-2)} = \frac{-36}{6} = \boxed{-6}$

3. For $f(x) = x^2 + 4x + 1$, find the rate of change on the interval [-2, 4].

$f(-2) = (-2)^2 + 4(-2) + 1 = 4 - 8 + 1 = -3$

$f(4) = (4)^2 + 4(4) + 1 = 16 + 16 + 1 = 33$

(-2, -3) (4, 33)
x_1 y_1 x_2 y_2

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{33-(-3)}{4-(-2)} = \frac{36}{6} = \boxed{6}$

4. You and a friend are trying to decide which theater to go to for a Friday night movie. NCG charges $7 for the movie ticket and $3 per food item. Regal's prices are represented by the table.

x	g(x)	
0	4	
1	8	+4
2	12	+4
3	16	+4
4	20	+4

Write an equation for NCG and Regal. Compare their rates of change and initial cost.

NCG: f(x) = $3x + 7$ **Regal: g(x)=** $4x + 4$

Characteristic NCG	<, >, or =	Characteristic of Regal
y-intercept of f(x) = 7	>	y-intercept of g(x) = 4
f(4) = $3(4)+7 = 19$	<	g(4) = $4(4)+4 = 20$
Rate of Change of f(x) = 3	<	Rate of Change of g(x) = 4