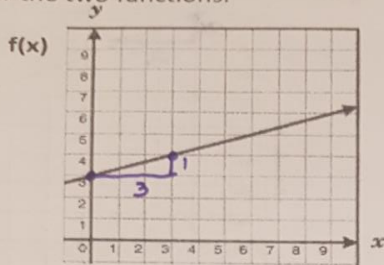


Comparing Linear vs. Linear Functions Task

$$\frac{y_2 - y_1}{x_2 - x_1}$$

The functions  $f(x)$  and  $g(x)$  are described below. Compare the rate of change and the initial amount for the two functions.



x	g(x)
0	2
1	4
2	6
3	8
4	10

Find the rate of change for  $f(x)$ .

slope:  
 $f(x) = \frac{1}{3}$

b. Find the rate of change for  $g(x)$ .

$$g(x) = \frac{4 - 2}{1 - 0} = \frac{2}{1} = 2$$

Which function is increasing faster?

$g(x)$  is increasing faster because of bigger slope

Find the initial amount for  $f(x)$ . (y-int)

y-intercept is 3.

e. Find the initial amount for  $g(x)$ . when  $x=0$

initial amount = 2

Which function has a larger initial amount?

$f(x)$  has a larger amount

Which of the following functions will have a rate of change that is greater than that of  $f(x)$  but less than that of  $g(x)$ ?

$$h(x) = \frac{1}{4}x + 11$$

$$h(x) = 1x + 11$$

$$h(x) = 4x + 11$$

Greater than  $f(x)$

$$h(x) = 1x + 11 ; h(x) = 4x + 11$$

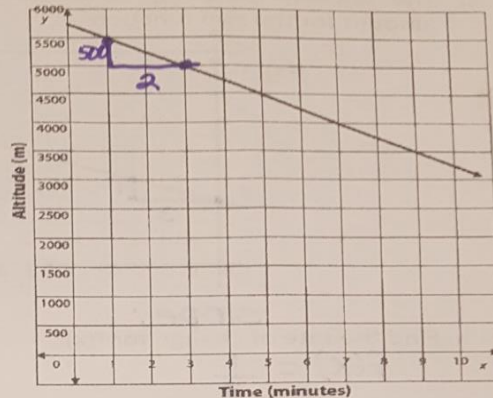
less than  $g(x)$

$$h(x) = 1x + 11, h(x) = \frac{1}{4}x + 11$$

Two airplanes are in flight. The function  $f(x) = -100x + 3,350$  represents the altitude,  $f(x)$ , of one airplane after  $x$  minutes. The graph represents the altitude of the second airplane.

$$f(x) = -100x + 3350$$

$g(x)$



rate of change:  $\frac{-500}{2} = -250 \text{ m/min}$

Which plane is decreasing faster?

$g(x) \rightarrow$  second plane, bigger slope

Which plane started out higher in the air?

$f(x)$  started at 3350

$g(x)$  started at 5750

$g(x)$  started out higher

Which plane will reach the ground first?

$$f(x) = -100x + 3350$$

$$0 = -100x + 3350$$

$$\begin{array}{r} -3350 \\ -100x + 3350 \\ \hline -100x = -3350 \\ x = 33.5 \end{array}$$

$g(x)$

$$g(x) = -250x + 5750$$

$$\begin{array}{r} 0 = -250x + 5750 \\ -5750 \\ \hline -250x = -5750 \\ x = 23 \end{array}$$

The gym offers 2 membership plans.

**Pay As You Go:** \$6 each time you work out

**Regular Deal:** \$50 per month plus \$2 each time you work out

$$y = 6x$$

$$y = 50 + 2x$$

a. What does the y-intercept represent for each function?

Pay as you go: No flat fee

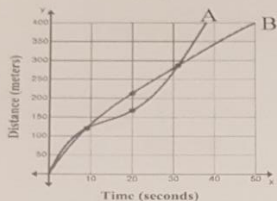
Reg. Deal: \$50 flat fee

b. **Pay As You Go** is the cheapest plan until you reach how many visits?

$$\begin{array}{l} 6x < 50 + 2x \\ 4x < 50 \\ x < 12.5 \end{array} \quad \boxed{13 \text{ visits}}$$

## Unit 2 Rate of Change (ROC)

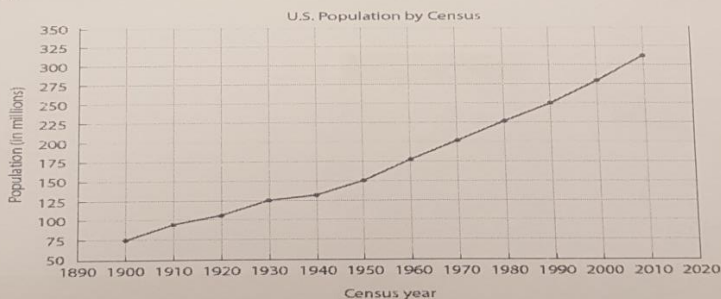
1. Below is the graph and table for 2 runners running the 400 meter hurdles race.



Time	Runner A	Runner B
0	0	0
9	120	120
20	168	213
31	287	287

- a) Which runner has a faster average speed for the first 9 seconds? *Neither, since they have the same ROC*  $A: \frac{120-0}{9-0}$   $B: \frac{120-0}{9-0}$
- b) Which runner has a faster average speed from 9 to 20 seconds? *Runner B 7 slope*  
 $A: \frac{168-120}{20-9} = \frac{48}{11} = 4.36$   $B: \frac{213-120}{20-9} = \frac{93}{11} = 8.45$
- c) Which runner has a faster average speed from 20 to 31 seconds? *Runner A 7 slope*  
 $A: \frac{287-168}{31-20} = \frac{119}{11} = 10.8$   $B: \frac{287-213}{31-20} = \frac{74}{11} = 6.72$
- d) Which runner has a faster average speed from 9 to 31 seconds? *Same slope*  
 $A: \frac{287-120}{31-9} = \frac{167}{22} = 7.59$   $B: \frac{287-120}{31-9} = \frac{167}{22} = 7.59$
- e) Which runner wins the race? How do you know? *Runner A, from the graph finished in less time.*

2. The graph below shows the United States population from 1900 to 2010, as recorded by the U.S. Census Bureau.



- a) What was the rate of change in the population from 1900 to 2000? Is this greater or less than the rate of change in the population from 2000 to 2010? *Less*  
 $1900-2000 = \frac{275-75}{2000-1900} = \frac{200}{100} = 2 \text{ ppl/yr}$   
 $2000-2010 = \frac{310-275}{2010-2000} = \frac{35}{10} = 3.5 \text{ ppl/yr}$
- b) Which 10-year time periods have the highest and the lowest rates of change? How did you find these?  
*Lowest: smaller slope: 1910-1920, 1930-1940*  
*Highest: largest slope: 1950-1960, 1960-1970, 1970-1980, 1980-1990; 1990-2000, 2000-2010*



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

$$\frac{45-37}{5-3} = \frac{8}{2} = 4 \text{ in/yr}$$

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

$$m = -6$$

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.

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

$$\text{NCG: } y = 3x + 7$$

$$\text{Regal: } y = 4x + 4$$

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

*m = rise/run*  
*+1* (for x) *+4* (for y)  
*+1* (for x) *+4* (for y)  
*+1* (for x) *+4* (for y)  
*+1* (for x) *+4* (for y)

Which theater is cheaper if you want to see the movie and also get a drink and popcorn?

$$y = 3(2) + 7$$

$$y = 12$$

$$y = 4(2) + 4$$

$$y = 12$$

Same price

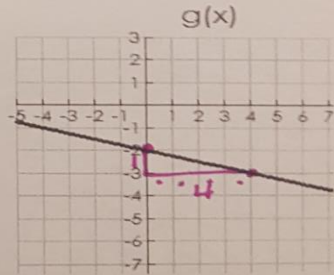
For the following two functions, write the equations of each and complete the chart using  $<$ ,  $>$ , or  $=$  to compare them.

$$f(x) = -2x + 5$$

$$g(x) = \frac{-1}{4}x - 2$$

x	f(x)
-1	7
0	5
1	3
2	1
3	-1

*+1* (for x) *-2* (for y)  
*+1* (for x) *-2* (for y)  
*+1* (for x) *-2* (for y)  
*+1* (for x) *-2* (for y)



Characteristic of f(x)	<, >, or =	Characteristic of g(x)
y-intercept of f(x) = 5	>	y-intercept of g(x) = -2
f(4) = -2(4) + 5 = -3	=	g(4) = -1/4(4) - 2 = -3
Rate of Change of f(x) = -2	<	Rate of Change of g(x) = -1/4