

# COLLEGE ALGEBRA

GPS #3

1.3

LINEAR FUNCTIONS

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## Useful Guidelines:

- \* Linear Function:  $f(x) = ax + b$  [If  $f(x) = b$  (constant function) and if  $f(x) = x$  (Identity Function)]  
 Its graph is a straight line. For each unit increase in  $x$ ,  $f(x)$  changes by an amount equal to  $a$ .
- \* Rate of Change for a Linear Function (slope of the graph): The output of a linear function changes by a constant amount for each unit increase in the input.
- \* When data have a constant rate of change, they can be modeled by  $f(x) = ax + b$ . The constant  $a$  represents the rate of change, and the constant  $b$  represents the initial amount or the value when  $x = 0$ .
- \* The slope of a line through the points  $(x_1, y_1)$  and  $(x_2, y_2)$  is

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}} \quad (x_1 \neq x_2). \quad \text{"Slope Formula"}$$

1. Determine whether  $f$  is a linear function. If  $f$  is linear, give values for  $a$  and  $b$  so that  $f$  may be expressed as  $f(x) = ax + b$ .

a)  $f(x) = -3x - 2$       $a = -3$     $b = -2$   
 yes it is  
 a linear function

b)  $f(x) = x^2 - 2$          no not linear

c)  $f(x) = \frac{8x}{3x} - \frac{4x+2}{3x}$   
 $= \frac{-4x-2}{3x}$   
 Not a linear function

d)  $f(x) = \sqrt{x} + 4$      Not linear  
 $= x^{1/2} + 4$

2. a) Find the slope, if it exists, of the line passing through the points  $(1, 9)$  and  $(8, 18)$ .

$$\frac{18 - 9}{8 - 1} = \frac{9}{7}$$

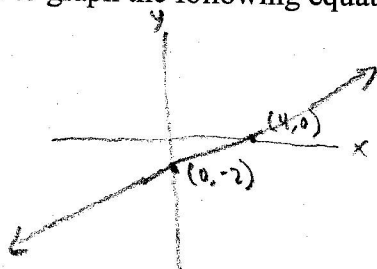
b) If a linear function has the points  $(1, 9)$  and  $(8, 18)$  on its graph, what is the rate of change of the function?

$$\text{Rate of change} = \frac{9}{7}$$

3. Use the intercepts to graph the following equations.

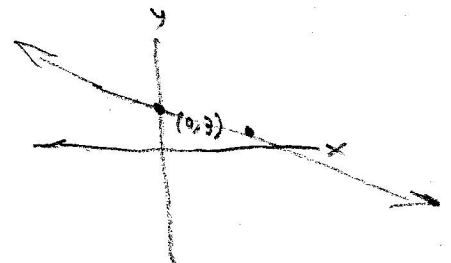
a)  $2y - x = -4$

$$\begin{array}{r|l} x & y \\ \hline 0 & -2 \\ -4 & 0 \end{array}$$



b)  $x + 3y = 9$

$$\begin{array}{r|l} x & y \\ \hline 0 & 3 \\ 9 & 0 \end{array}$$



4. Suppose the monthly cost for the manufacture of tennis balls is  $C(x) = 1220 + 0.21x$ , where  $x$  is the number of tennis balls produced each month.

a) What is the slope of the graph of the total cost function?

$$\$0.21/\text{unit}$$

b) What is the marginal cost (rate of change of the cost function) for the product?

$$\$0.21$$

c) What is the cost of each additional ball that is produced in a month?

$$\$0.21$$