

Sections 2.4 & 2.5 - Equations of Lines

In class work: Complete all statements. Solve all exercises.

Linear Equation in Two Variables

Standard form: $ax + by = c$, where a and b are not both zero.

Slope –Intercept form: $y = mx + b$, where m is the slope of the line, $(0,b)$ is the yintercept

Slope –Point form: $y - y_1 = m(x - x_1)$, where m is the slope of the line and (x_1, y_1) is a point on the line.

Vertical Line: $x = k$, where k is a constant

Horizontal Line: $y = k$, where k is a constant.

Slope of a Line

$m = \frac{\text{change in } y}{\text{change in } x}$ as we move from one point to another on the line.

$$m = \frac{\Delta y}{\Delta x} = \frac{y_1 - y_2}{x_1 - x_2} = \frac{y_2 - y_1}{x_2 - x_1}$$

The slope m is the rate of change of y with respect to x .

Properties of Lines

Two distinct lines are parallel if and only if they have the same slope.

$$l_1 \parallel l_2 \Leftrightarrow m_1 = m_2$$

Two lines are perpendicular if and only if the product of their slopes is -1.

$$l_1 \perp l_2 \Leftrightarrow m_1 \cdot m_2 = -1 \Leftrightarrow m_1 = -\frac{1}{m_2}$$

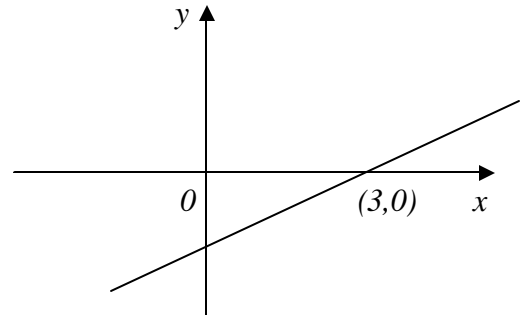
Exercise #1 Complete the following ordered pairs to make solutions to the equation $x + 2y = 8$: $(0, ?), (? , 0), (-\frac{4}{3}, ?)$

Exercise #2 Complete the table for the equation $y = \frac{2}{3}x$:

x	y
0	
	2
-1	
	$\frac{3}{2}$

Exercise #3 The graph of $2x - 3y = 6$ is given .

- Is $(0, 0)$ a solution?
 - Is $(3, 0)$ a solution?
 - Is $(-2, 1)$ a solution?
- Prove algebraically and graphically.



Exercise #4 An equation for the concentration of toxic chemicals is $C = 285 - 15t$, where C is the concentration in part per milliliter (ppm), and t is the number of years from now.

- Find the intercepts of the graph and graph the equation using the intercepts.
- What is the significance of the intercepts ?

Exercise #5 A computer store budgets \$12,000 to buy computers and laser printers. Each computer costs \$650 and each printer costs \$200.

- Write an equation that models the given situation.
- Sketch the graph. Be sure to label the axes clearly.
- What is the significance of the intercepts?
- If the store buys 4 computers, how many printers can they buy?

Exercise #6 What is the equation of the

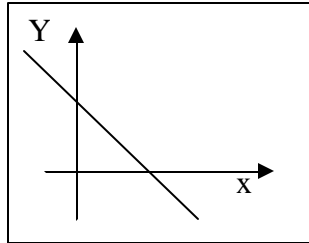
- horizontal line that passes through $(2, 3)$?
- vertical line that passes through $(4, -3)$?
- x -axis?
- y -axis?

Exercise #7 The weight (in kilograms) of a pumpkin is measured as it grows over a particular month. After 2 days, the pumpkin weighed 3 kilograms while at 31 days, the pumpkin's weight was 9 kilograms.

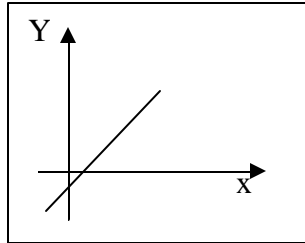
- Assuming the weight is growing at a linear rate, find a formula that gives the weight "W" (in kilograms) in terms of the number of days "D"
- What are the units of the slope and what does it mean in this problem.

Exercise #8 Match the graphs (I) – (VI) with the equations given below. (You shouldn't need to graph each equation to determine which is which!) NOTE: The x and y scales may be unequal. Show all work.

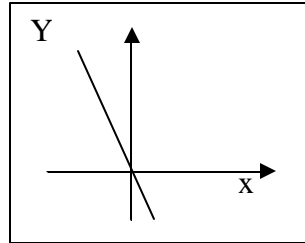
- a. $y = .005x + .009$ b. $x = -py$ c. $y = \frac{5}{2} - \frac{3}{4}x$ d. $x - \sqrt{1000} = 0$ e. $3x + 4y + 10 = 0$
 f. $y = 351x - 140$



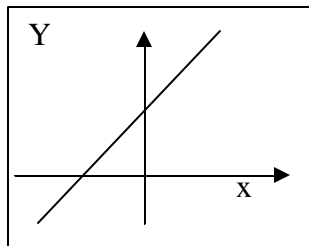
(I)



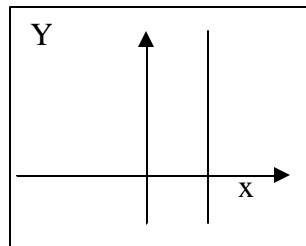
(II)



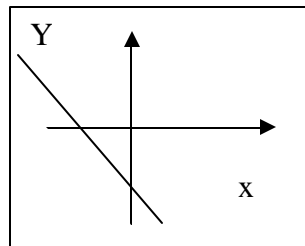
(III)



(IV)



(V)



(VI)

Exercise #9 At a University, campus food services decides to sell gourmet coffee from a cart in front of the library. The table below is a projection of the cost to the university of selling various amounts of coffee.

Total cost to serve x cups of coffee in a day

x (cups)	0	5	10	50	100	200
C (dollars)	50.00	51.25	52.50	62.50	75.00	100.00

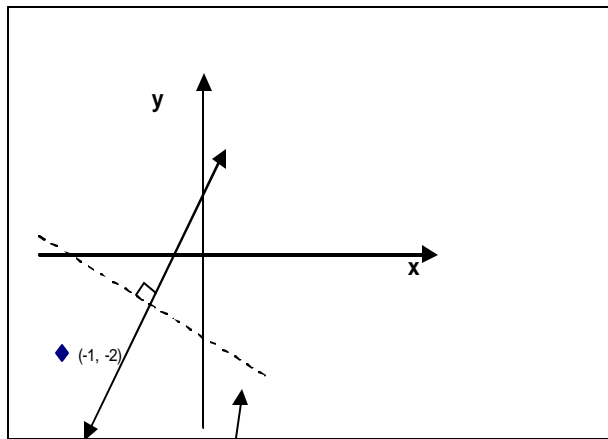
- Using the table, show that the relationship is linear.
- Plot the data found in the table.
- Find the slope of the line. Explain what this means in the context of the given situation.
- What will it cost to serve 13 cups of coffee in a day?

Exercise #10 Are the lines given by these equations parallel, perpendicular or neither?

$$y - \frac{2}{3}x = 0; \quad 3y = 2x + 1.$$

Exercise #11 Find an equation of the line that passes through the point $(-1, 2)$ and is perpendicular to $\frac{5}{18}x + \frac{1}{6}y = \frac{2}{3}$.

Exercise #12 Find the equation of the solid line graphed below.



$$\frac{1}{2}x + \frac{5}{4}y + 2 = 0$$

Exercise #13 (2.4 - # 64, 66) Find the slope of the line passing through each pair of points or state that the slope is undefined. Assume that all variables represent positive real numbers.

- a) $(-a, 0)$ and $(0, -b)$ b) $(a - b, c)$ and $(a, a + c)$

Exercise #14 Write the slope-intercept equation of a function f whose graph passes through $(-5, 6)$ and is perpendicular to the line that has an x -intercept of 3 and a y -intercept of -9 .

Exercise #15 A linear function that models data is described. Find the slope of each model and its meaning.

- a) $f(x) = 0.01x + 57.7$ models the global average temperature of Earth, $f(x)$, in degrees Fahrenheit, x years after 1995.

Exercise #16 The scatter plot shows the number of college students in the United States, in thousands, enrolled exclusively in online education from 2002 through 2007. Also shown is a line that passes through or near the six data points.

- a) Use the coordinates of the two points to compute the slope of the line. Describe the meaning of the slope.
 b) Write a linear function that models the number of college students enrolled exclusively in online education, in thousands, x years after 2002.
 c) Predict the number of college students who will be enrolled exclusively in online education in 2010.

