

## Section A.6

### Section Objectives:

- Recognize a function whose graph is a line algebraically, graphically and from a table.
- Know the definition of the slope of a line. Recognize lines with positive, negative, zero and undefined slope.
- Find the slope of a line from an algebraic expression, a graph and a table.
- Find the equation of a line given two points, or a point and a slope.
- Given either a table of values, and algebraic equation or a graph of a line, find the other two.
- Use both point-intercept, and point-slope forms to find the equation of a line.
- Recognize and find parallel and perpendicular lines.

### Practice Problems

1. Determine which of the tables below could represent a linear function. Find the equation of the line and sketch a graph.

x	y
1	5
2	7
4	11
6	15

x	y
1	2
2	3
3	5
4	8

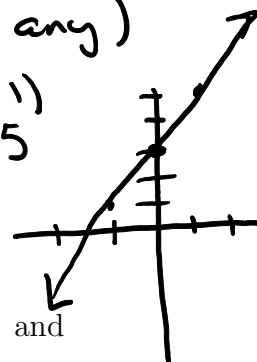
Slopes:  $(1,2) \rightarrow (2,3)$   $\frac{3-2}{2-1} = 1$   
 $(2,3) \rightarrow (3,5)$   $\frac{5-3}{3-2} = \frac{2}{1} = 2$   
 Different slopes, not linear

(check all slopes)

$(1,5) \rightarrow (2,7)$   $\frac{7-5}{2-1} = 2$   
 $(2,7) \rightarrow (4,11)$   $\frac{11-7}{4-2} = 2$   
 $(4,11) \rightarrow (6,15)$   $\frac{15-11}{6-4} = 2$

all slopes 2  $\Rightarrow$  linear  $\rightarrow$  slope is 2

slope: 2  
 point (1,5) (choose any)  
 eqn:  $y - 5 = 2(x - 1)$   
 $y = 2x - 2 + 5$   
 $y = 2x + 3$



2. Find the equation of the line between (2,3) and (4,9) in both point-slope form and point-intercept form.

First find the slope:  $\frac{9-3}{4-2} = \frac{6}{2} = 3$ .

point: (2,3) eqn:  $y - 3 = 3(x - 2)$  (point-slope form)  
 Slope: 3

$y = 3x - 6 + 3$

$y = 3x - 3$

(point-intercept form)

3. Graph  $2x + 4y = 6$ . Find the  $x$ -intercepts and  $y$ -intercepts both graphically and numerically.

Rewrite in slope intercept form:

$$2x + 4y = 6$$

$$4y = -2x + 6$$

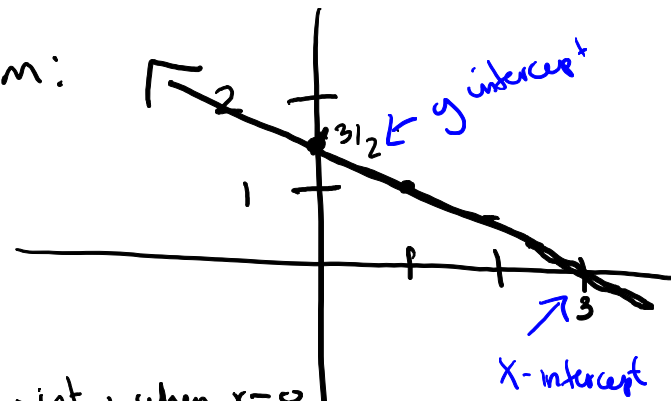
$$y = -\frac{1}{2}x + \frac{3}{2}$$

$x$ -intercept: when  $y = 0$

$$2x + 4(0) = 6 \Rightarrow 2x = 6 \Rightarrow x = 3$$

$y$ -int, when  $x = 0$

$$4y = 6 \Rightarrow y = \frac{3}{2}$$



4. Find the equation of a line parallel to  $y = 3x + 4$  which passes through the point  $(2, 3)$ .

Since parallel to  $y = 3x + 4$ , must have same slope.

Slope is 3, point  $(2, 3)$ .

$$\text{eqn: } y - 3 = 3(x - 2) \Rightarrow y = 3x - 6 + 3 \Rightarrow y = 3x - 3$$

5. Find the  $y$  intercept of the line perpendicular to  $y = 3x - 2$  at the point  $(1, 1)$ . Illustrate with a graph.

First find eqn of the line.

Slope: perpendicular to  $y = 3x - 2$  whose slope is 3, so has slope  $-\frac{1}{3}$ .

point:  $(1, 1)$ .

$$\text{eqn: } y - 1 = -\frac{1}{3}(x - 1)$$

$$y = -\frac{1}{3}x + \frac{1}{3} + 1$$

$$y = -\frac{1}{3}x + \frac{4}{3}$$

$y$ -intercept is  $\frac{4}{3}$

**More Practice from Textbook A.6:** You should do as many problems from each set (1-8, 9-20, 21-24, 25-46, 47, 48, 49-64), as needed until you are comfortable with these techniques. Problems 49-64 are great practice for more in depth word problems.