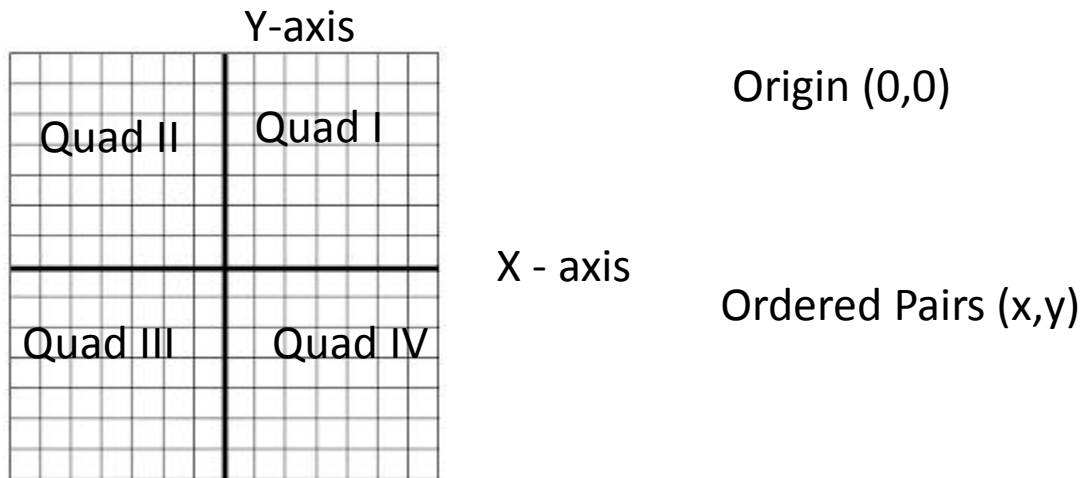# Chapter 3

Graphing Linear Equations and Functions

3.1 Plot Points in a Coordinate Plane

- Coordinate Plane

Y-axis

Quad II	Quad I
Quad III	Quad IV

Origin (0,0)

X - axis

Ordered Pairs (x,y)

- Domain: x – values, inputs
- Range: y – values, outputs

3.2 Graph Linear Equations

- Linear Equation: Ax + By = C
- Solutions: (x,y) that make equation true
  - Plug in x and y to see
- Solutions lie in a straight line: Graph
- To graph the solutions (line) make x | y chart

- Pick 3 values for x and plug them in 3 times

- Solve equation for y (get y by itself)
  - Makes plug in easier
- Ex.)   10x − 2y = 6
- $\underline{\qquad -10x \qquad\qquad -10x}$
- $\underline{-\,2y} = \underline{6} \underline{-\,10x}$
-         -2   -2   -2

- y = -3 + 5x

Special Lines

- 1. Horizontal Line
- $y = b$ $y = 6$

- No x term
- Crosses y axis

- 2. Vertical Line

    x = a   x = 5

- No y term
- Crosses x axis

Special Domains and Ranges

- Rules for making x | y chart

- Can only choose certain values
- x $\geq$ 5 means the x values start at 5 and get bigger
-            for the x's
- x $\leq$ 0 means the x values start at 0 and get smaller
- 3 $\leq$ x $\leq$ 7 means the x values start at 3 and only go to 7

3.3 Graph Using Intercepts

- Easier way to Graph.
- Use the two key points
- 1. x-intercept, where line crosses x- axis, y = 0
- 2. y-intercept, where line crosses y-axis, x=0
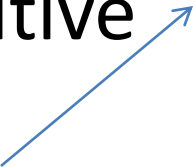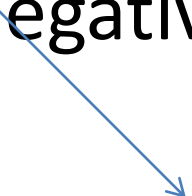
- 2 points determine a line

- To find intercepts:
  - 1. let x = 0, solve for y
  - 2. let y = 0, solve for x

  - Ex.)   y = 2x − 5
  - 1. x=0,   y = 2(0) − 5   y = -5

  - 2. y=0   0 = 2x − 5
  - _____+ 5_____+5___
  -                5 = 2x
  -                2   2

  -            $2\frac{1}{2} = x$

3.4 Find Slope and Rate of Change

- **Slope**: the tilt of the line, slant between 2 points

- $(x_1, y_1), (x_2, y_2)$

- $m = \dfrac{rise}{run} = \dfrac{change\ in\ y}{change\ in\ x} = \dfrac{y_2 - y_1}{x_2 - x_1}$

- Positive   Negative   Zero   No

- (horizontal)   (Vertical)

Rate of Change

- Find Slope of 2 points in chart: $\dfrac{\$12}{2\,h}$

- Divide ratio to find rate $6 / hr

- Find missing x value or y value given slope
  - Ex: (1,2) (3,y) if $m = \dfrac{2}{3}$

3.5 Graph Using Slope-Intercept Form

- Standard Form: ax + by = c
- **Slope-Intercept Form**: y = mx + b
  - m is the slope
  - b is the y-intercept   (0,b)

- **Must be in slope-intercept form to pick out the slope and intercept**

To Graph

- Using Slope and Intercept

- 1. Put in slope-intercept form:
  - y = mx + b   (Solve for y)
- 2. m =   b =
- 3. Start at b, on y-axis
- 4. move *m* from *b,* $\dfrac{rise}{run}$

Parallel Lines

- Lines are **parallel** if the slopes are the same

    - $y = 3x + 6$
    - $y = 3x - 2$

3.6 Direct Variation

- Another kind of linear equation
- Comes in form **y = mx**
- Reads: y varies directly with x
- The constant of variation: m
- To graph: line that always goes through origin

3.7 Linear Functions

- Linear Function: replaces y with *f*(x)

  - *f*(x) = mx + b

  - m is slope
  - b is y -intercept

- *Example:*   *f(x) = 2x + 1*

- *f*(3)
- plug in 3 for x $f(3) = 2(3) + 1$ $f(3) = 7$

- *f*(x) = 3
- plug in 3 for y $2x + 1 = 3$ $x = 1$

- To Graph: use slope(m) and   y-int. (b)

- Remember: 1ˢᵗ point b (y-intercept)

- $\qquad\qquad$ then slope (m) $\dfrac{rise}{run}$

- The parent function: f(x) = x