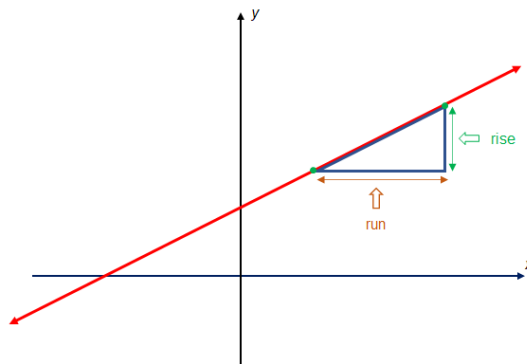


# 1.0 Linear Relations (Review)

## A Slope

- ✓ Slope  $m$  is a measure of the steepness of a line and is defined by:

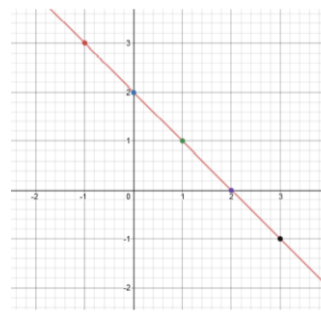
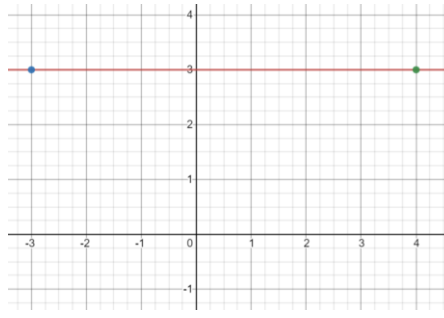
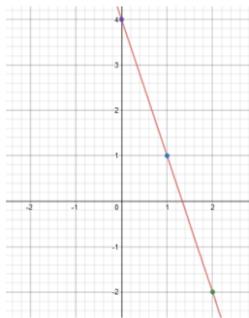
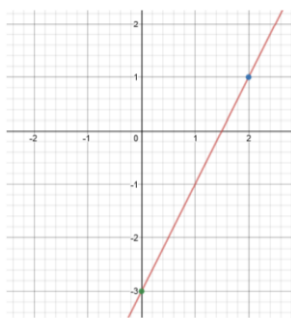
$$m = \frac{\text{rise}}{\text{run}}$$



Notes:

- ✓ Run is always positive (left to right).
- ✓ Rise may be positive (up) or negative (down).

Ex 1. For each case, find the slope.



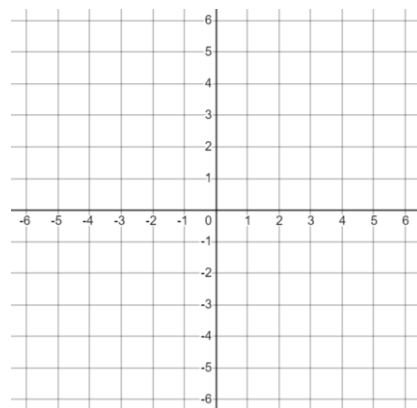
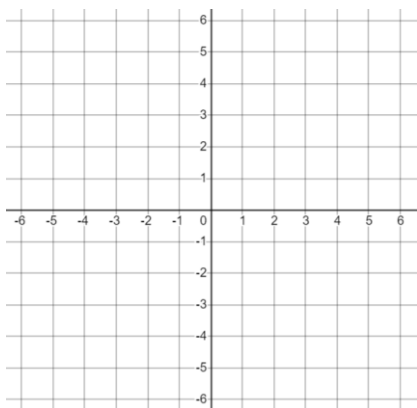
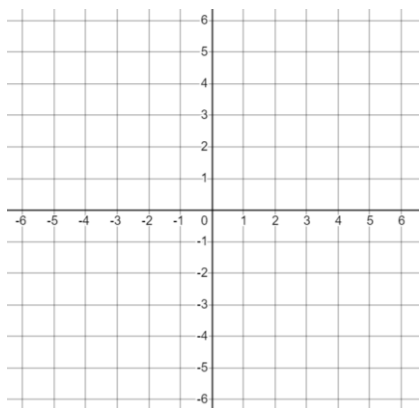
a)

b)

c)

d)

Ex 2. Draw a line of slope given below.



a)  $m = 3$

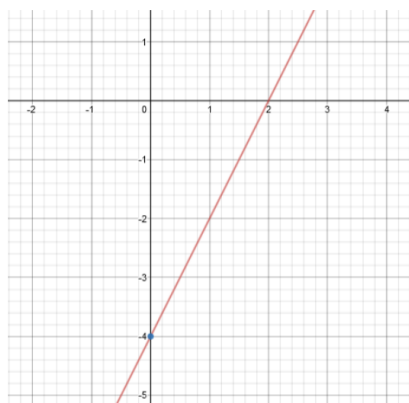
b)  $m = -2$

c)  $m = 4/5$

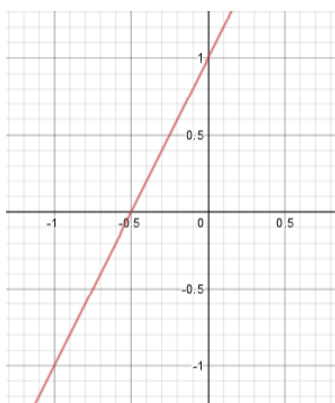
## B y-intercept Point

- ✓ y-intercept point is point of intersection between the graph of a line and the y-axis

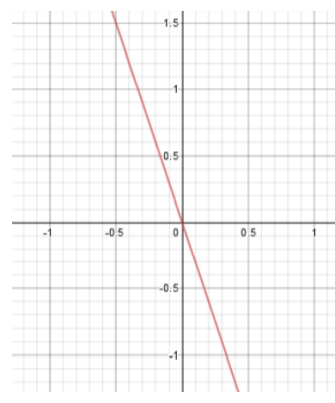
Ex 3. For each case, find the y-intercept point.



a)



b)



c)

## C Equation of a Line

- ✓ Equation of a line (linear relation) may be written in the form (called the slope – y-intercept form)

$$y = mx + b$$

where

- $m$  is the slope
- $b$  is the y-intercept value

$$y = mx + b$$

y-intercept  
↓  
 $mx$   $+ b$   
↑  
slope

Ex 4. For each case, identify the slope and the y-intercept.

a)  $y = 2x + 3$

b)  $y = -x - 2$

c)  $y = -\frac{3}{2}x$

## D Graphing Lines

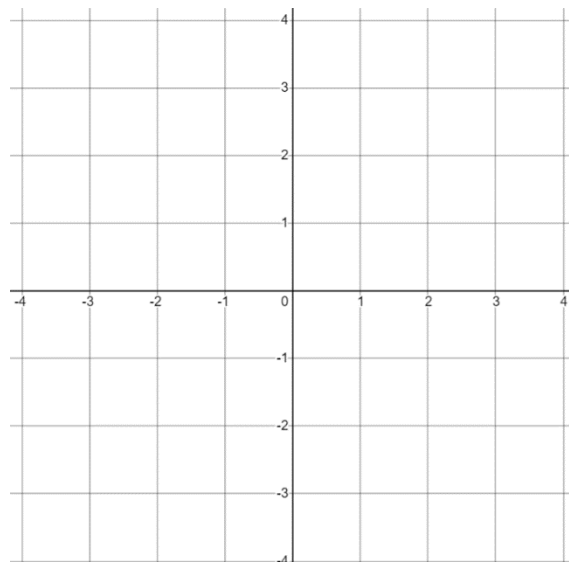
- ✓ In order to graph a line, use the y-intercept and the slope

Ex 5. Graph each line on the grid provided on the right.

a)  $y = -2x + 4$

b)  $y = 3x - 2$

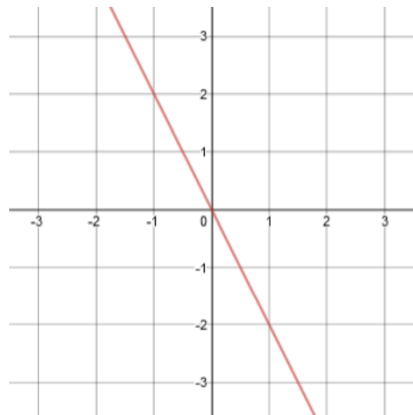
c)  $y = -\frac{1}{2}x + 3$



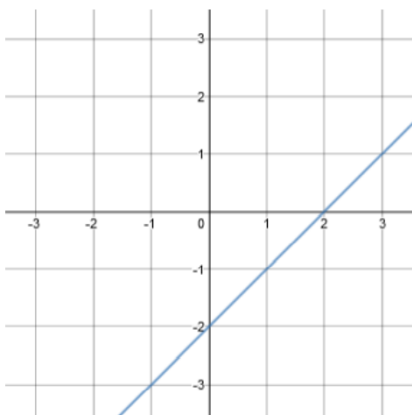
## E Equation of a Line

- ✓ To find the equation of a line given graphically:
  - find the y-intercept ( $y_{int} = b$ )
  - find the slope ( $slope = m$ )
  - substitute y-intercept and slope in  $y = mx + b$

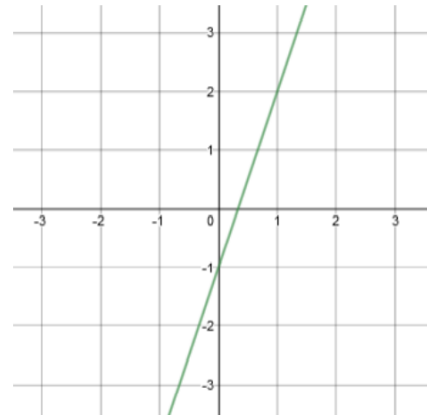
Ex 6. Find the equation of each line.



a)



b)



c)

## F Implicit Form

- ✓ The *implicit equation* of a line is given by:

$$Ax + By + C = 0$$

Note. The implicit equation is also called *standard* or *Cartesian* equation.

Ex 7. Convert the line given in the slope y-intercept form  $y = -\frac{1}{2}x + 3$  to the implicit form.

Ex 8. Convert the line given in the implicit form  $-2x + 3y - 4 = 0$  to the slope y-intercept form.

## G Intercepts

Intercepts (points) are the points at which the line crosses the *coordinate axes*.

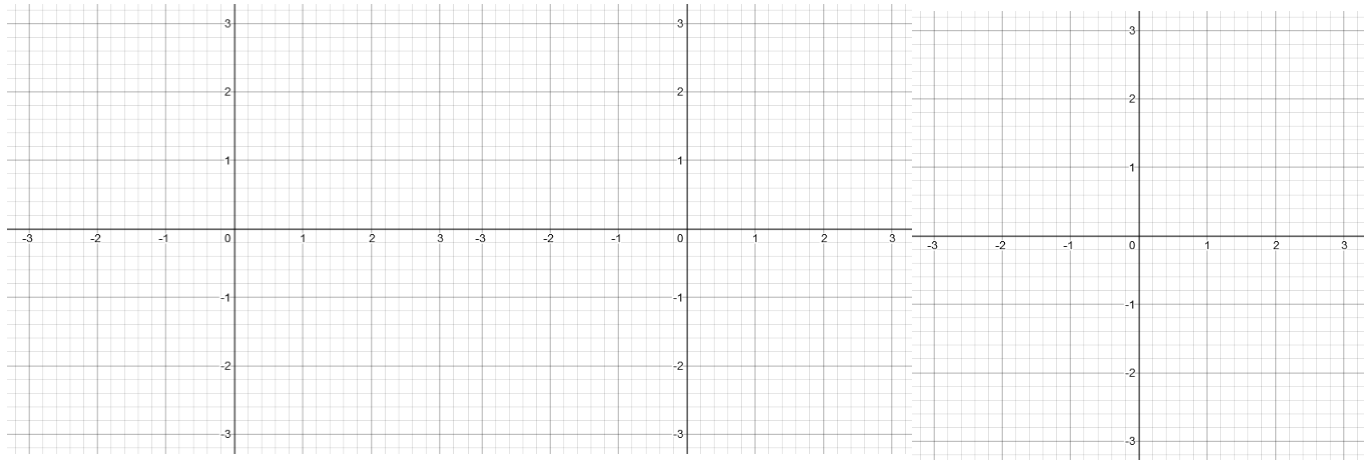
- ✓ To get the *x-intercepts*, substitute  $y = 0$  and *solve* for  $x$ .
- ✓ To get the *y-intercept*, substitute  $x = 0$  and *solve* for  $y$ .

Ex 9. For each case, find the *x-intercept* and the *y-intercept*, then graph the line.

a)  $y = 2x - 4$

b)  $x + y = 2$

c)  $2x - 3y + 6 = 0$

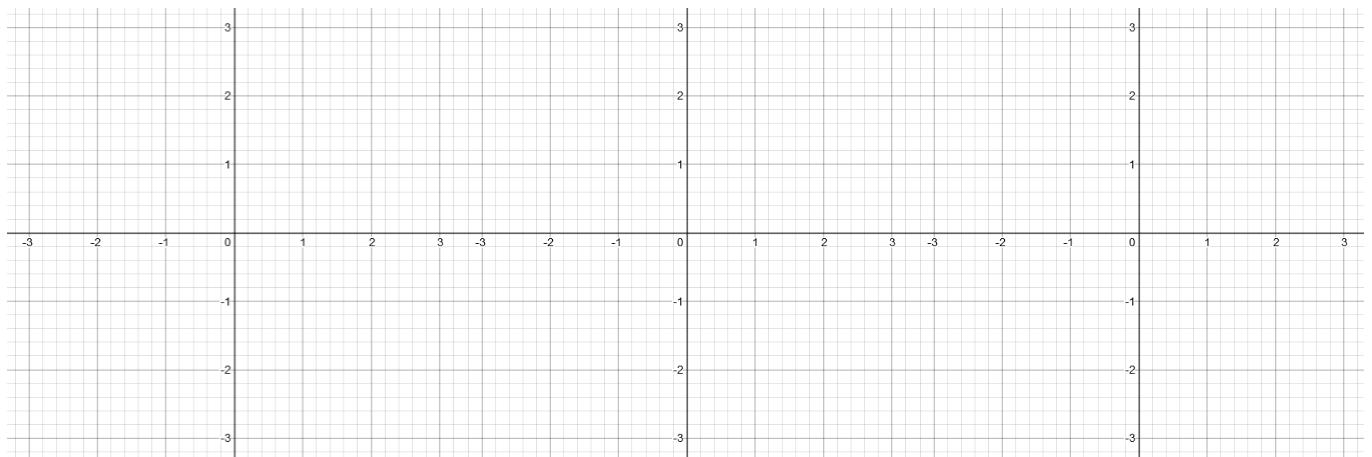


Ex 10. Draw the following linear relations.

a)  $y = 3$

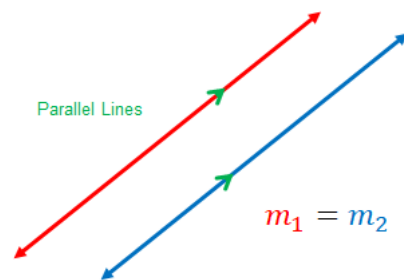
b)  $x = -2$

c)  $x - 2y = 2$



## H Parallel Lines

- ✓ Two lines are parallel if their slopes are equal.
- ✓  $m_1 = m_2$



Ex 11. For each pair, verify if the lines are parallel or not.

a)

$$L_1: y = -3x - 5$$
$$L_2: y = -x - 5$$

b)

$$L_1: 2y - x + 3 = 0$$
$$L_2: y = \frac{1}{2}x$$

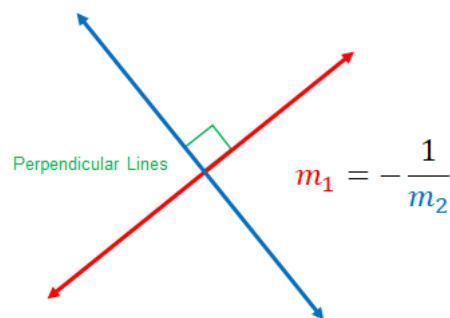
c)

$$L_1: x = 5$$
$$L_2: x + 3 = 0$$

Ex 12. Find the equation of the line  $L_2$  that passes through the point  $P(2, -3)$  and is parallel to the line  $L_1: y = 3x + 4$

## I Perpendicular Lines

- ✓ Two lines are perpendicular to each other if their slopes are negative reciprocal.
- ✓  $m_1 \cdot m_2 = -1$  or  $m_2 = -\frac{1}{m_1}$



Ex 13. For each pair, verify if the lines are perpendicular to each other or not.

a)

$$L_1: y = 2x - 5$$
$$L_2: 2y + x + 3 = 0$$

b)

$$L_1: 2y - x = 1$$
$$L_2: x = \frac{1}{2}y$$

c)

$$L_1: x = 1$$
$$L_2: y - 2 = 0$$

Ex 14. Find the equation of the line  $L_2$  that passes through the point  $P(0,4)$  and is perpendicular to the line

$$L_1: x - 2y = 5$$

Notes: Textbook Pages 4-5

Homework: Pages 4-5 # 5, 6, 7, 8