

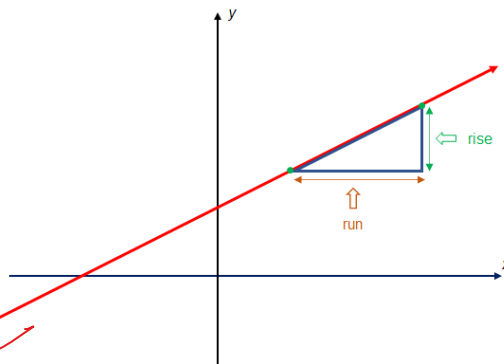
1.0 Linear Relations (Review)

A Slope

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

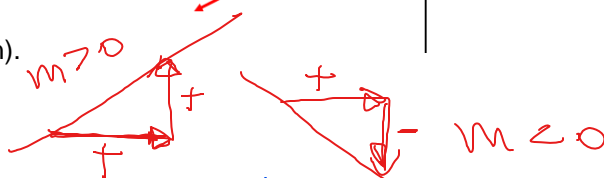
$$m = \frac{\text{rise}}{\text{run}}$$

run > 0

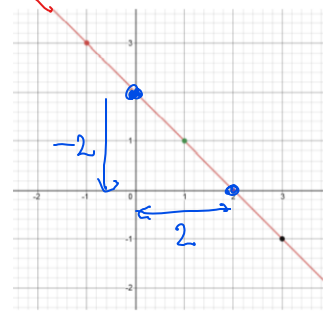
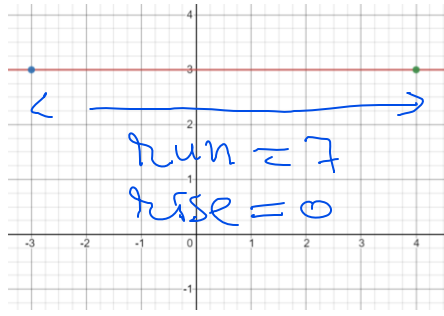
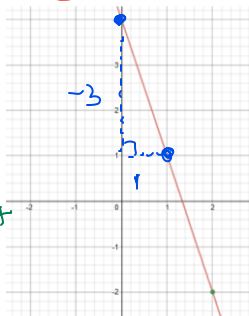
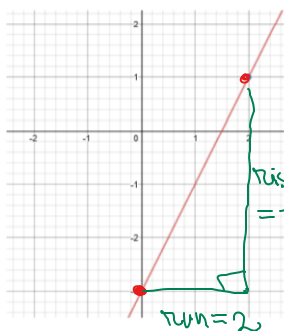


Notes:

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



Ex 1. For each case, find the slope. $m = ?$



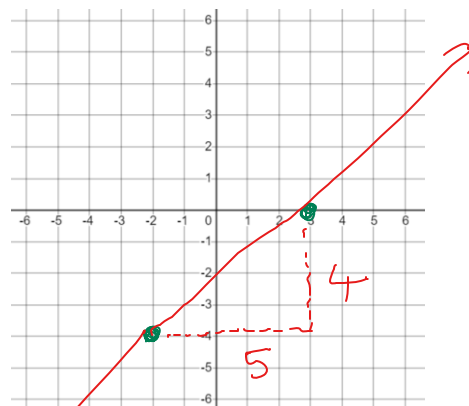
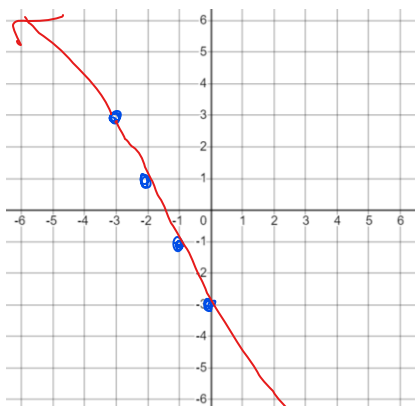
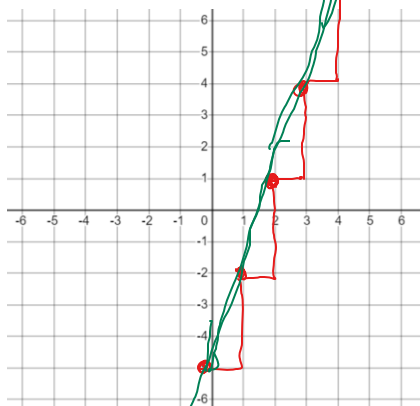
a) $m = \frac{4}{2}$
 $\therefore m = 2$

b) $m = \frac{-3}{1}$
 $\therefore m = -3$

c) $\therefore m = 0$
 (line is a horizontal line)

d) $m = \frac{-2}{2}$
 $\therefore m = -1$

Ex 2. Draw a line of slope given below.



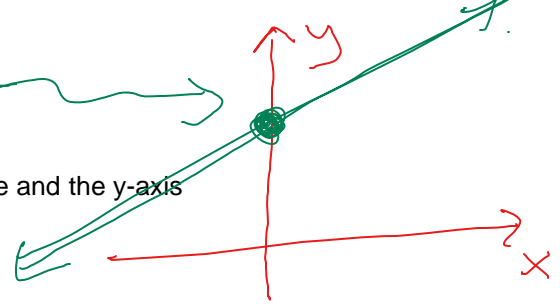
a) $m = 3 = \frac{3}{1}$

b) $m = -2 = \frac{-2}{1}$

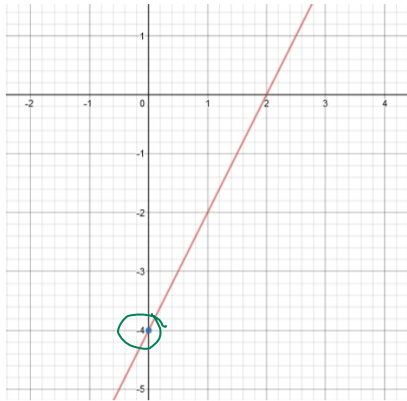
c) $m = \frac{4}{5} = \frac{4}{5}$

B y-intercept Point

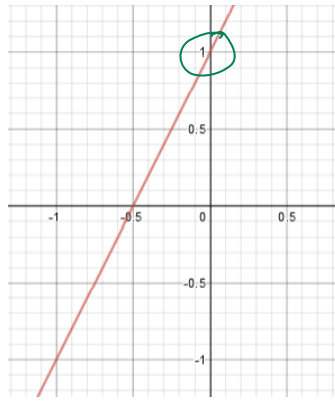
✓ y-intercept point is point of intersection between the graph of a line and the y-axis



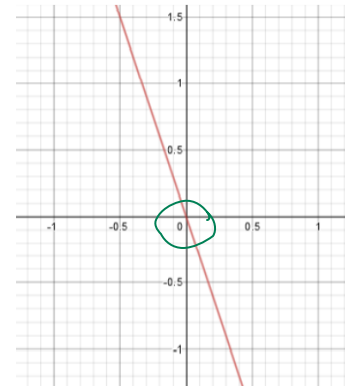
Ex 3. For each case, find the y-intercept point.



a) $(0, -4)$



b) $(0, 1)$



c) $(0, 0)$

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

$1 \neq x=0$
then $y=b$
(y-intercept value)

$$y = mx + b$$

Annotations: 'slope' is written below m with an upward arrow. 'y-intercept value' is written to the right of b with a downward arrow.

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

a) $y = 2x + 3$

b) $y = -x - 2$

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

$m =$
 $y\text{-in}$

D Graphing Lines

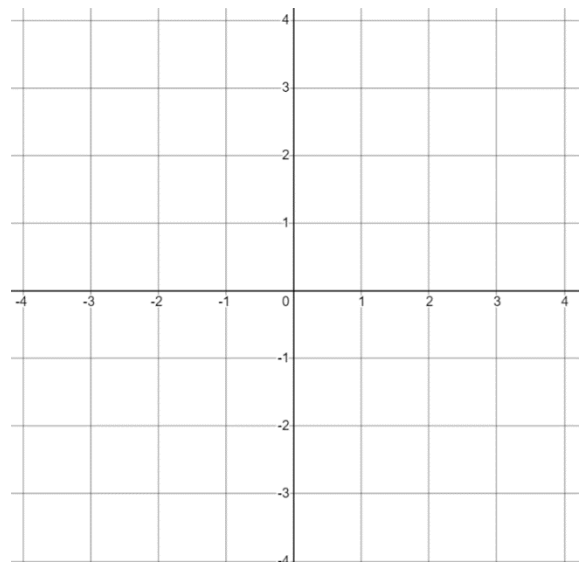
✓ In order to graph a line, use the y-intercept and the slope

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

a) $y = -2x + 4$

b) $y = 3x - 2$

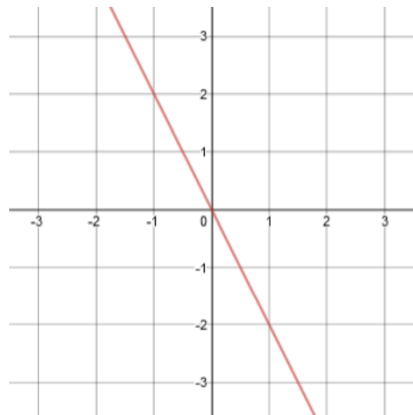
c) $y = -\frac{1}{2}x + 3$



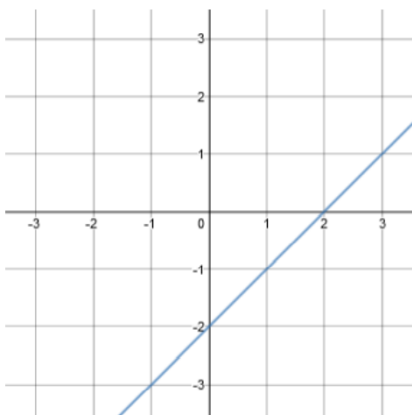
E Equation of a Line

- ✓ 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 $y = mx + b$

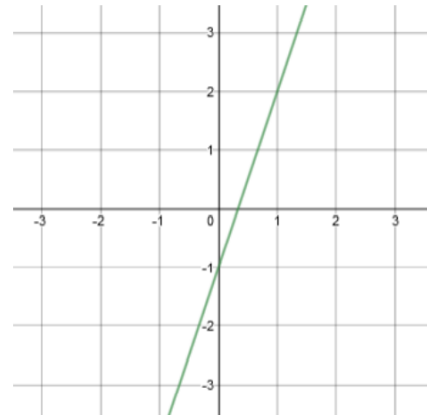
Ex 6. Find the equation of each line.



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*.

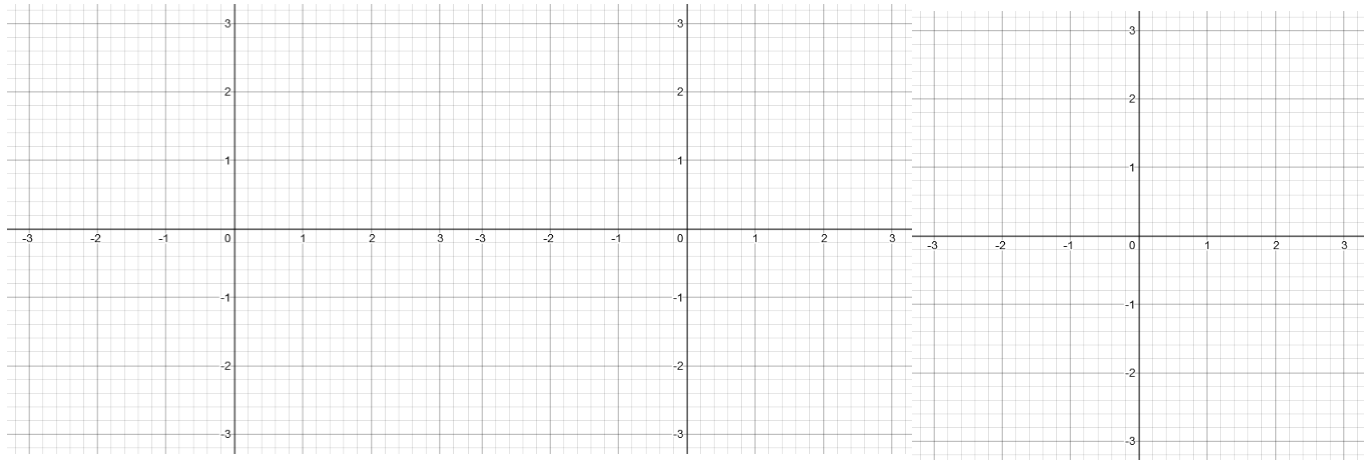
- ✓ To get the *x-intercepts*, substitute $y = 0$ and *solve* for x .
- ✓ To get the *y-intercept*, substitute $x = 0$ and *solve* for y .

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

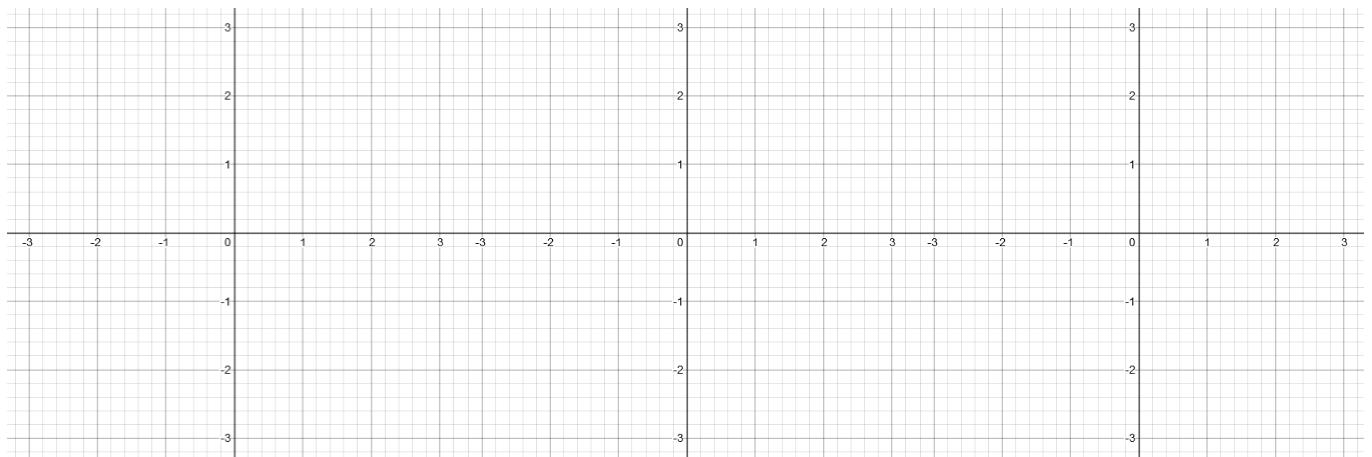


Ex 10. Draw the following linear relations.

a) $y = 3$

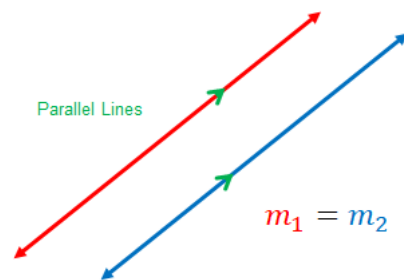
b) $x = -2$

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)

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

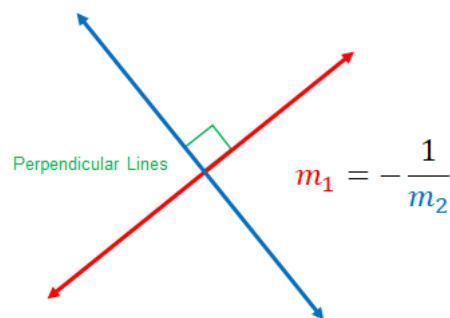
c)

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

Ex 12. Find the equation of the line L_2 that passes through the point $P(2, -3)$ and is parallel to the line $L_1: x + 2y - 3 = 0$

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