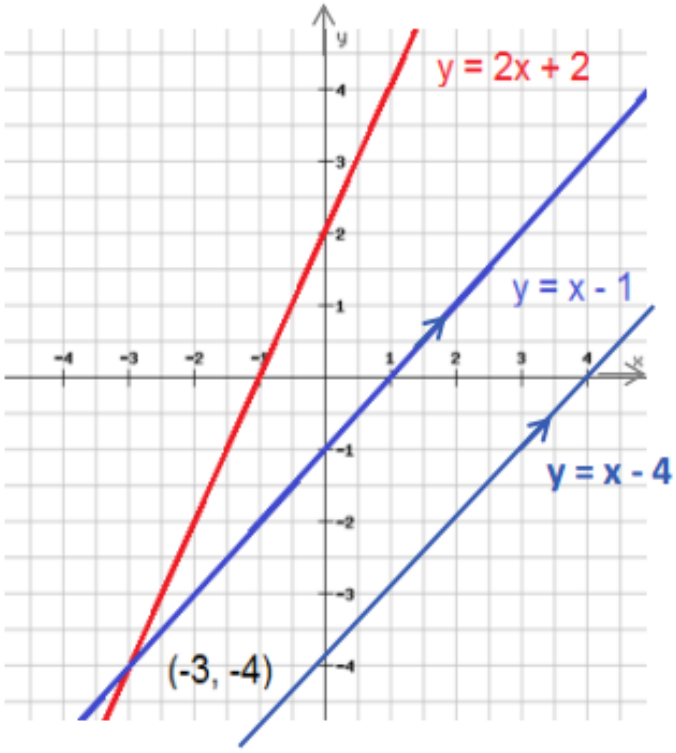
Grade 9

Mathematics

READING MATERIAL



Unit 20
Graphs

L.K. AMARAKOON
R/SIVALI CENTRAL COLLEGE

By studying this lesson you will be able to…

- identify functions
- draw graphs of functions of the form $y = mx$, $y = mx + c$ and identify their characteristics.
- identify the gradient and intercept of a straight line graphs,
- plot straight line graphs of equations of the form $ax + by = c$
- identify the relationship between the gradients of straight lines which are parallel to each other.

Straight line graphs

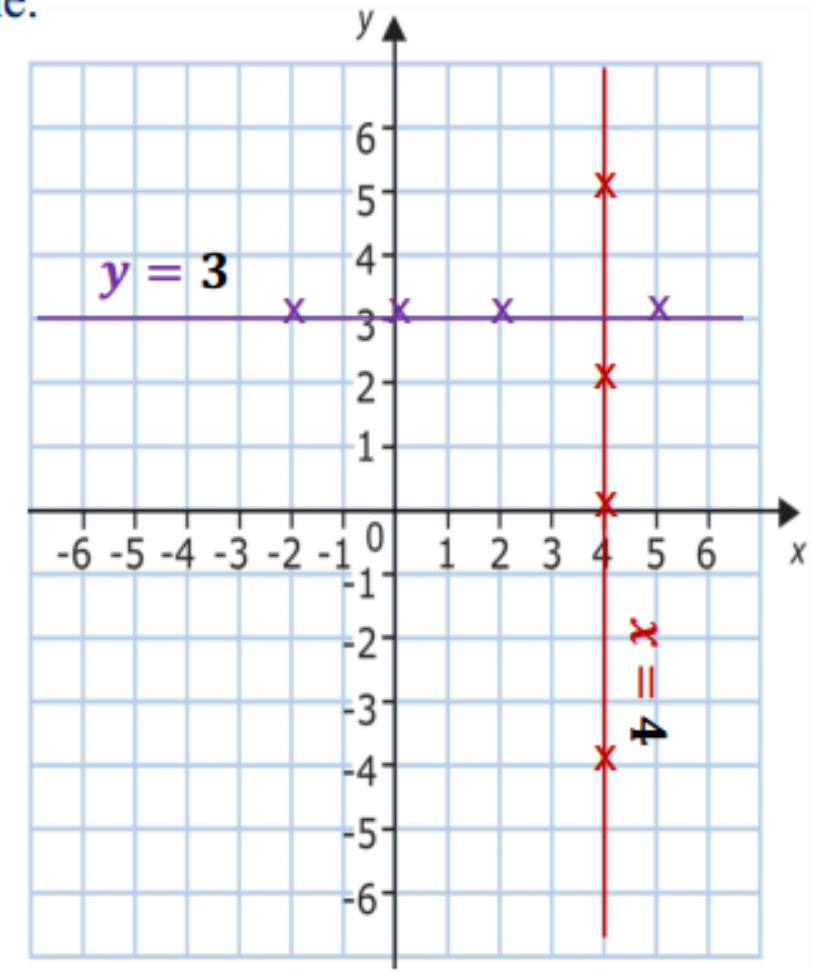
Let's draw a coordinate plane with x and y axes and mark following points. Then join those points and obtain a straight line.

i) (-2,3) , (0,3) , (2,3), (5,3)

Equation of the straight line $y = 3$

ii) (4,-4) , (4,0) , (4,2), (4,5)

Equation of the straight line $x = 4$



Functions

Price of 1m of wire is Rs. 5.00

Number of meters of wire	Price Rs.
1	$1 \times 5 = 5$
2	$2 \times 5 = 10$
3	$3 \times 5 = 15$
4	$4 \times 5 = 20$

Lets us take the number of meters of wire as 'x' and the corresponding price as Rs. y,

$$y = 5x$$

Dependent variable

Independent variable

Functions

- Let's consider above type of functions,

Ex:- - i) $y = 5x$
ii) $y = 2x + 3$

Index of x is one. There fore those types of functions called as linear functions.

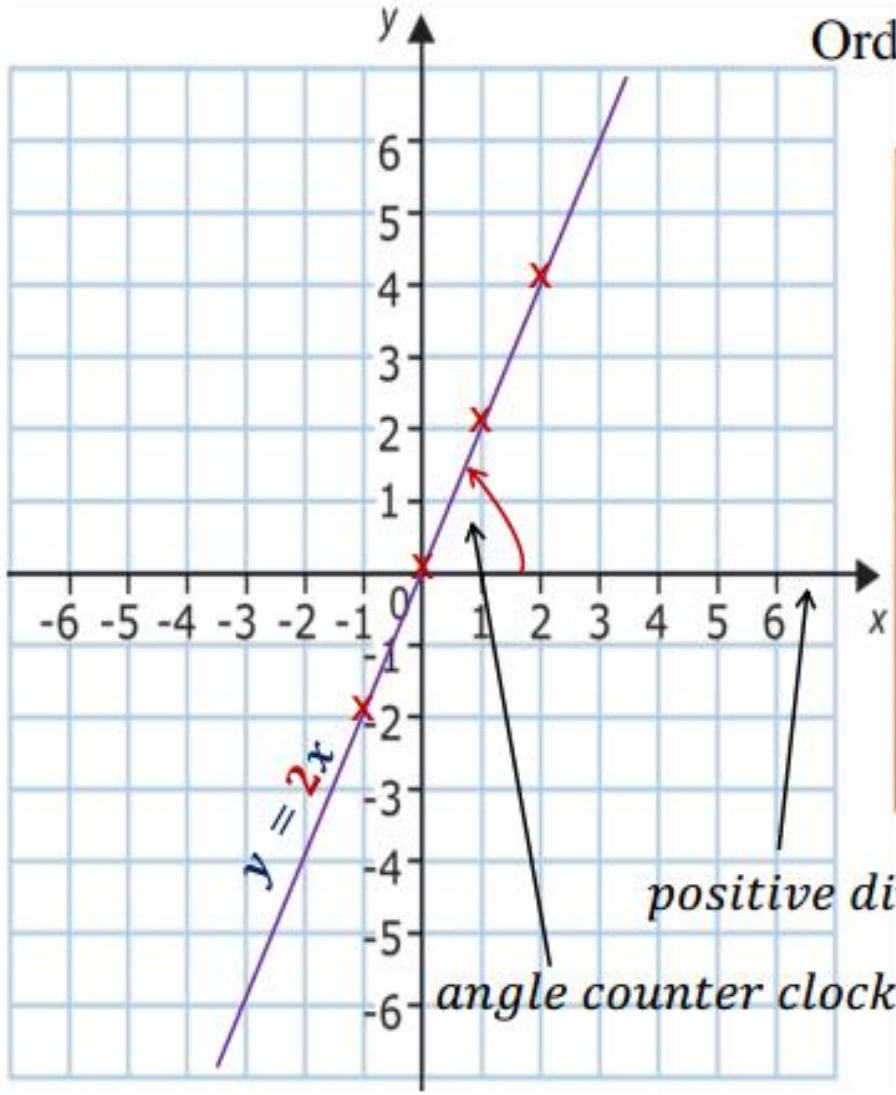
- In grade 10 we will discuss about quadratic functions.

Ex:- - i) $y = 2x^2$
ii) $y = 2x^2 + 3$

Graph of function of the form $y = mx$

1 Draw the graph of function $y = 2x$ using suitable table of values.

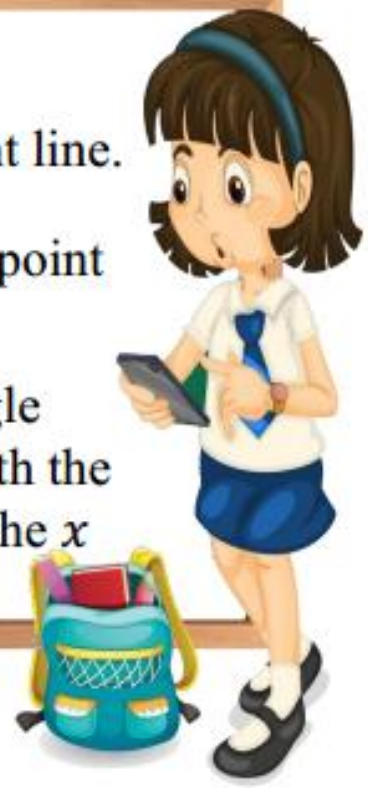
x	$2x$	y	(x, y)
-1	$2 \times (-1)$	-2	$(-1, -2)$
0	2×0	0	$(0, 0)$
1	2×1	2	$(1, 2)$
2	2×2	4	$(2, 4)$



Ordered pairs:-$(-1,-2)$, $(0,0)$, $(1,2)$, $(2,4)$

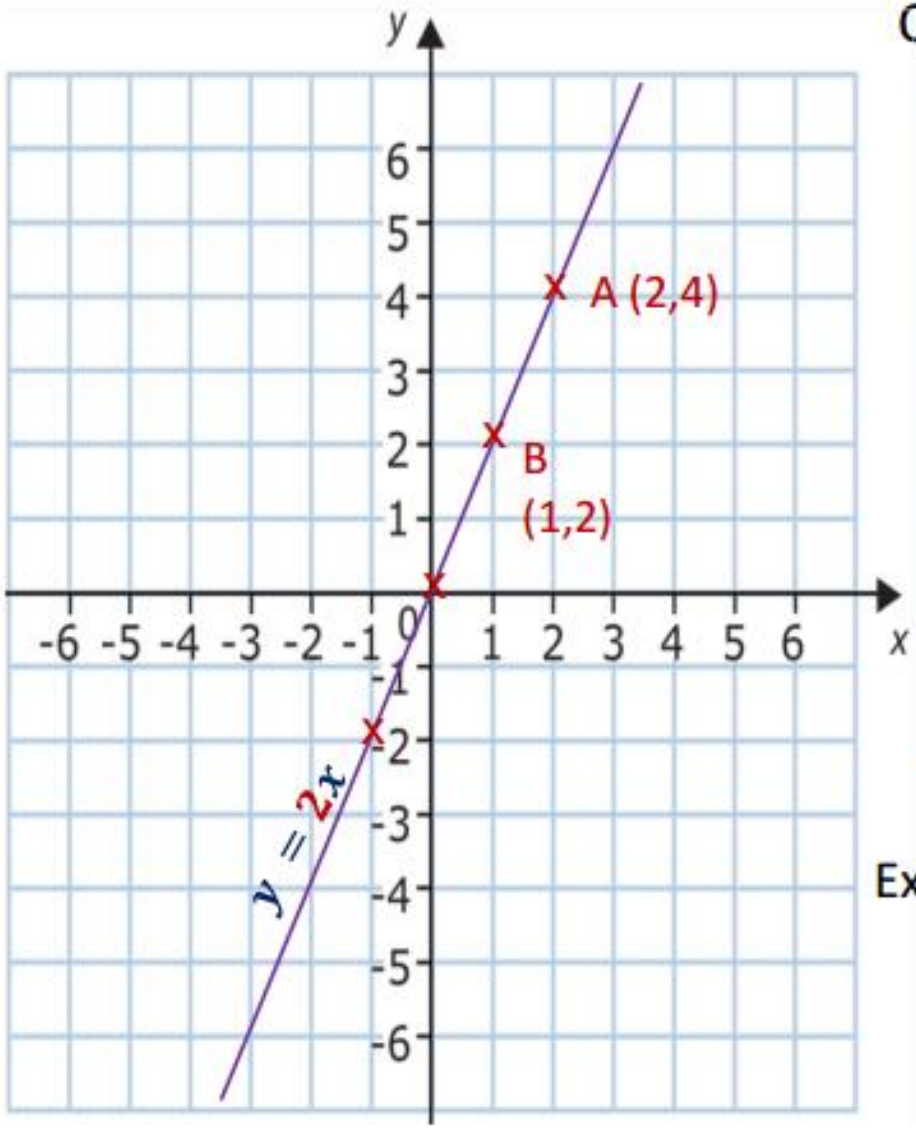
Characteristics of the graph

- The graph is a straight line.
- It passes through the point $(0, 0)$ [origin]
- It makes an acute angle counter clockwise with the positive direction of the x axis.



positive direction of x axis

angle counter clockwise with the positive direction of x axis



Ordered pairs $(-1,-2)$ $(0,0)$, $(1,2)$, $(2,4)$

Characteristics of the graph

- Except origin, consider any point on straight line. Then,

$$\frac{y \text{ coordinate}}{x \text{ coordinate}} = a \text{ constant}$$

Ex : Consider point A, Consider point B,

$$\frac{4}{2} = 2 \qquad \frac{2}{1} = 2$$

This constant value is equal to the coefficient (m) of a function of the form y = mx
This constant value is called the gradient of the graph

- $y = 2x$; Gradient of the function , $m = 2$

  ↑
  gradient (coeffient of x)

Ex:– i) Gradient of the graph of the function $y = -3x$; $m = -3$

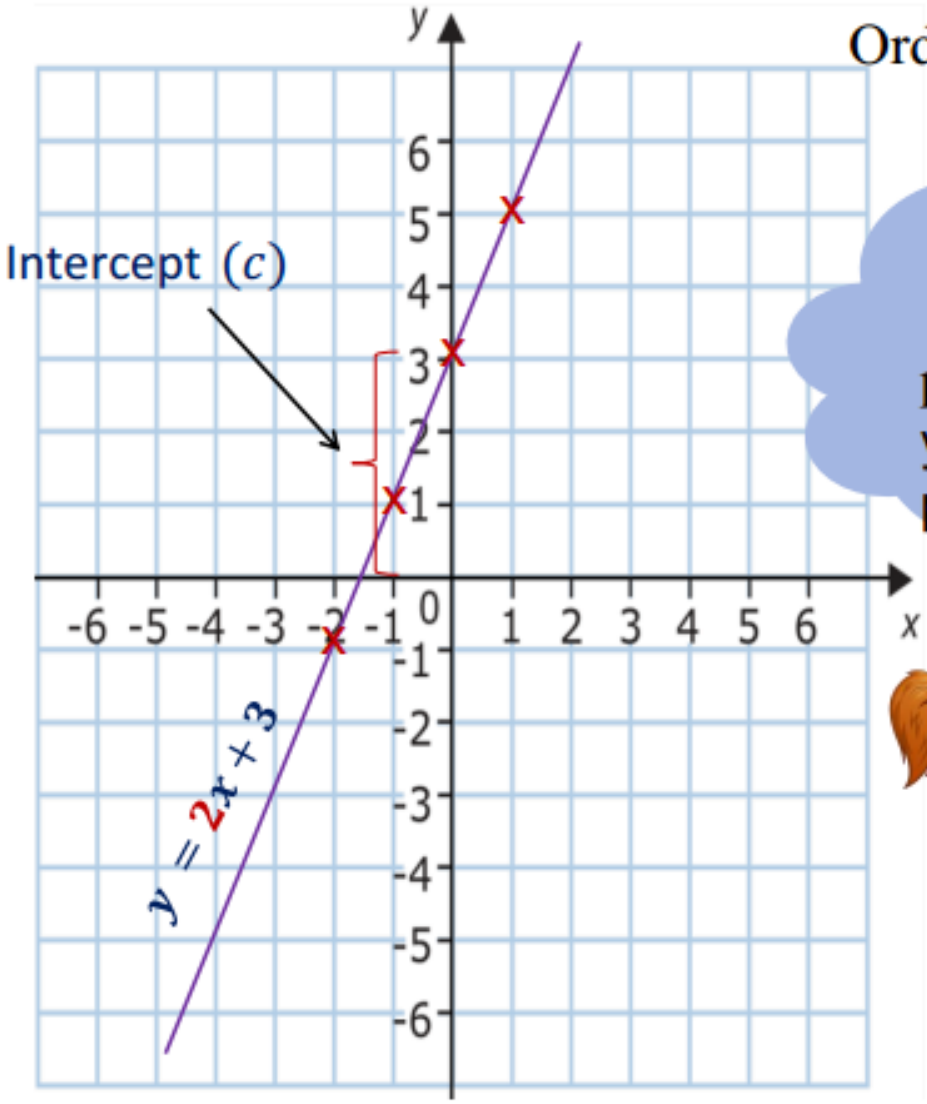
ii) Gradient of the graph of function $y = x$; $m = 1$

iii) Gradient of the graph of function $y = \frac{2}{3}x$; $m = \frac{2}{3}$

Graph of functions of the form $y = mx + c$

1 Draw the graph of the function $y = 2x + 3$ using suitable table of values.

x	$2x + 3$	y	(x, y)
-2	$2 \times (-2) + 3$	-1	$(-2, -1)$
-1	$2 \times (-1) + 3$	1	$(-1, 1)$
0	$2 \times 0 + 3$	3	$(0, 3)$
1	$2 \times 1 + 3$	5	$(1, 5)$



Ordered pairs: $(-2,-1)$, $(-1,1)$, $(0,3)$, $(1,5)$

Graph intersect the y axis at the point(0,3)
y coordinate of that point is 3

That value called as intercept (c) of the graph

- In the graph of the function of $y = 2x + 3$

  $i)$ gradient $(m) = 2$

  $ii)$ intercept $(c) = 3$

- According in the graph $y = mx + c$ of the function of,

$$y = mx + c$$

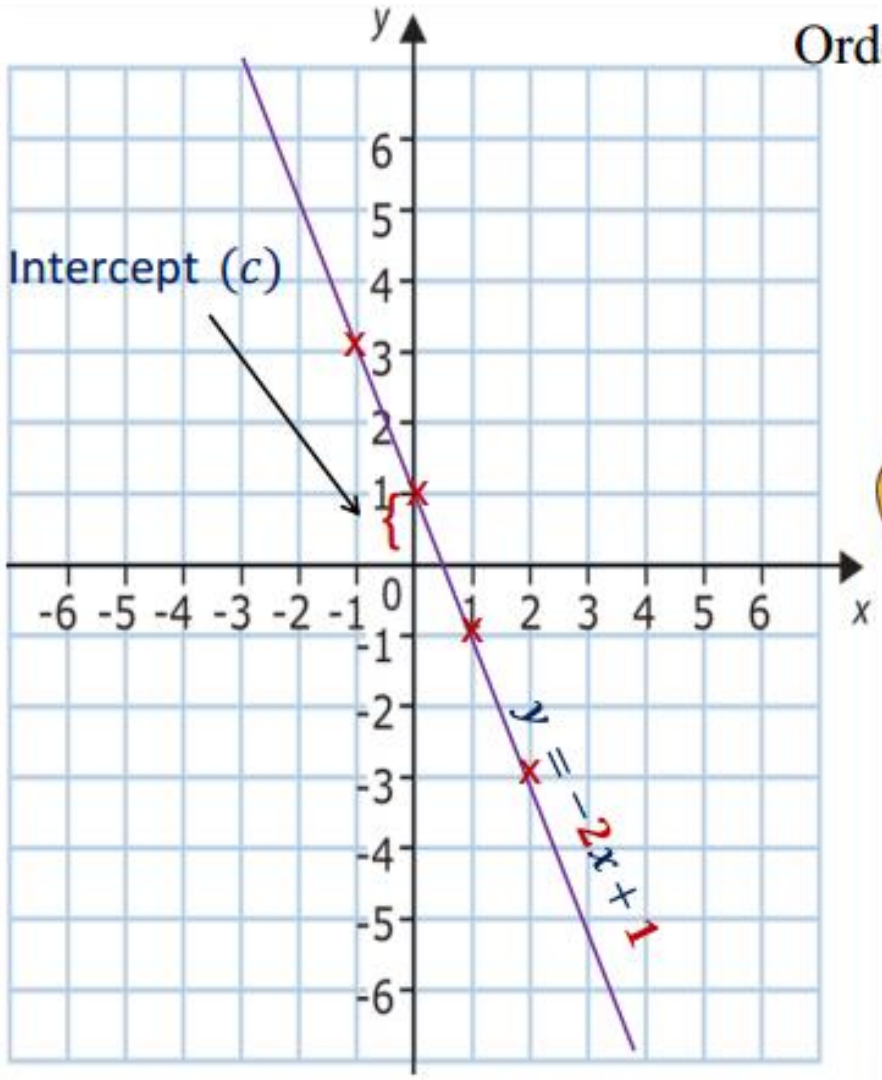
gradient — m

intercept — c

Graph of functions of the form $y = mx + c$

2 Draw the graph of the function $y = -2x + 1$ using suitable table of values.

x	$-2x + 1$	y	(x, y)
-1	$-2 \times (-1) + 1$	3	$(-1, 3)$
0	$-2 \times 0 + 1$	1	$(0, 1)$
1	$-2 \times 1 + 1$	-1	$(1, -1)$
2	$-2 \times 2 + 1$	-3	$(2, -3)$



Ordered pairs: $(-1,3)$, $(0,1)$, $(1,-1)$, $(2,-3)$

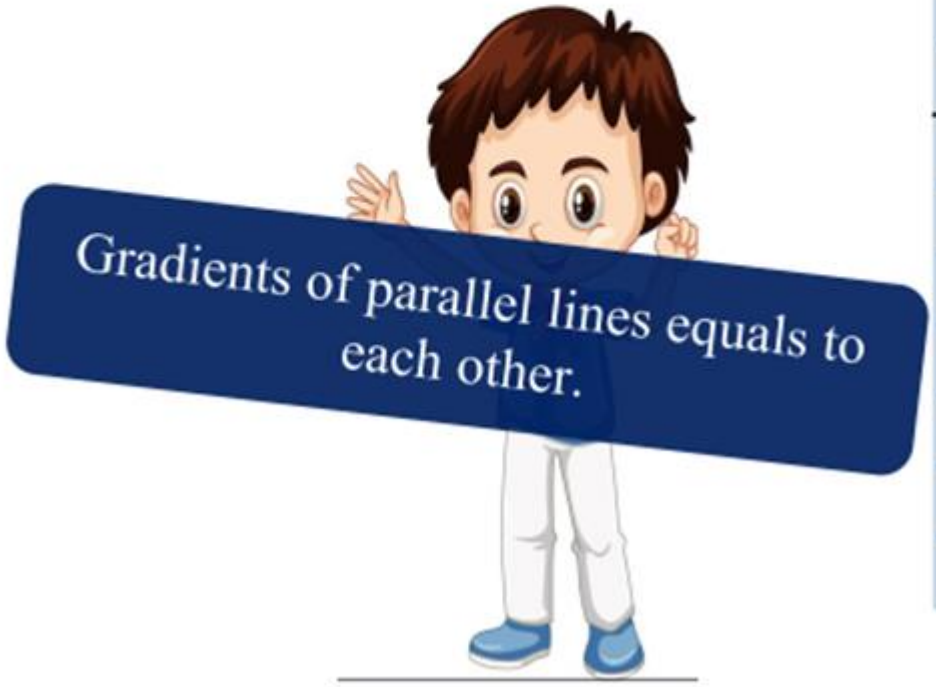
In the graph of the function of $y = -2x + 1$

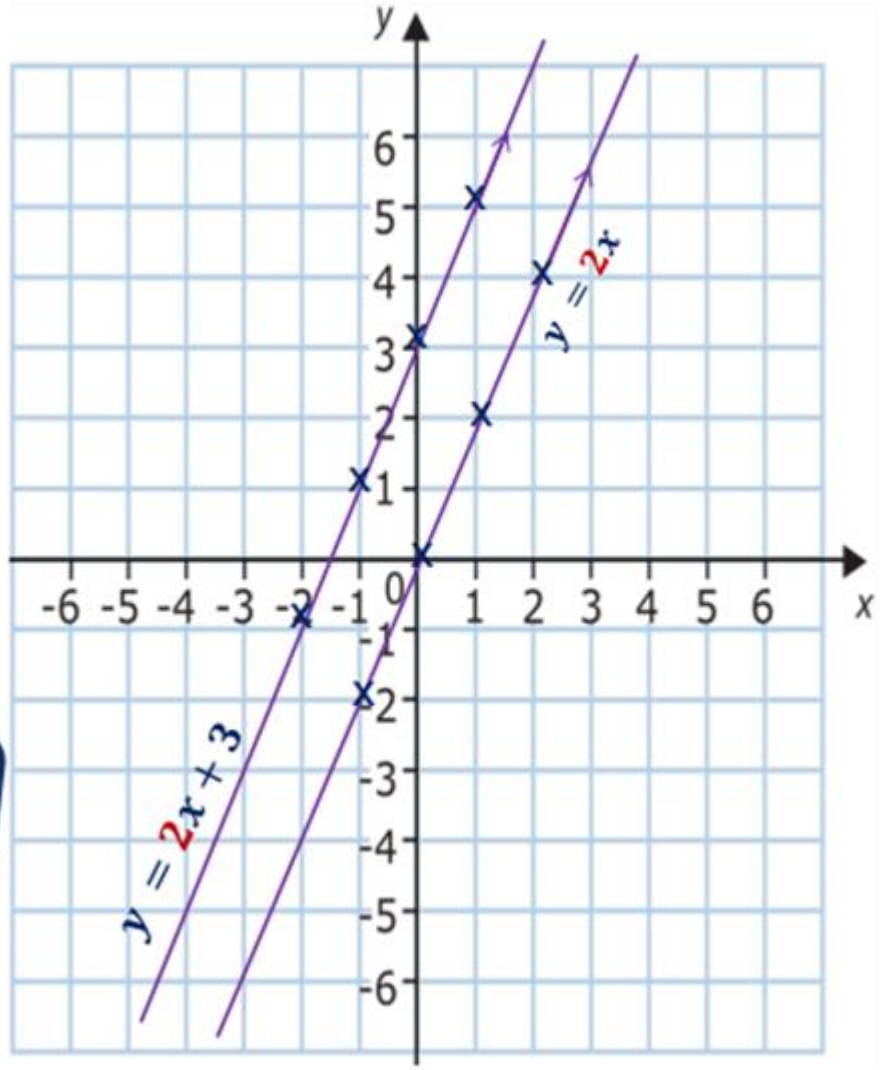
i) gradient (m) = -2

ii) Intercept(c) = 1

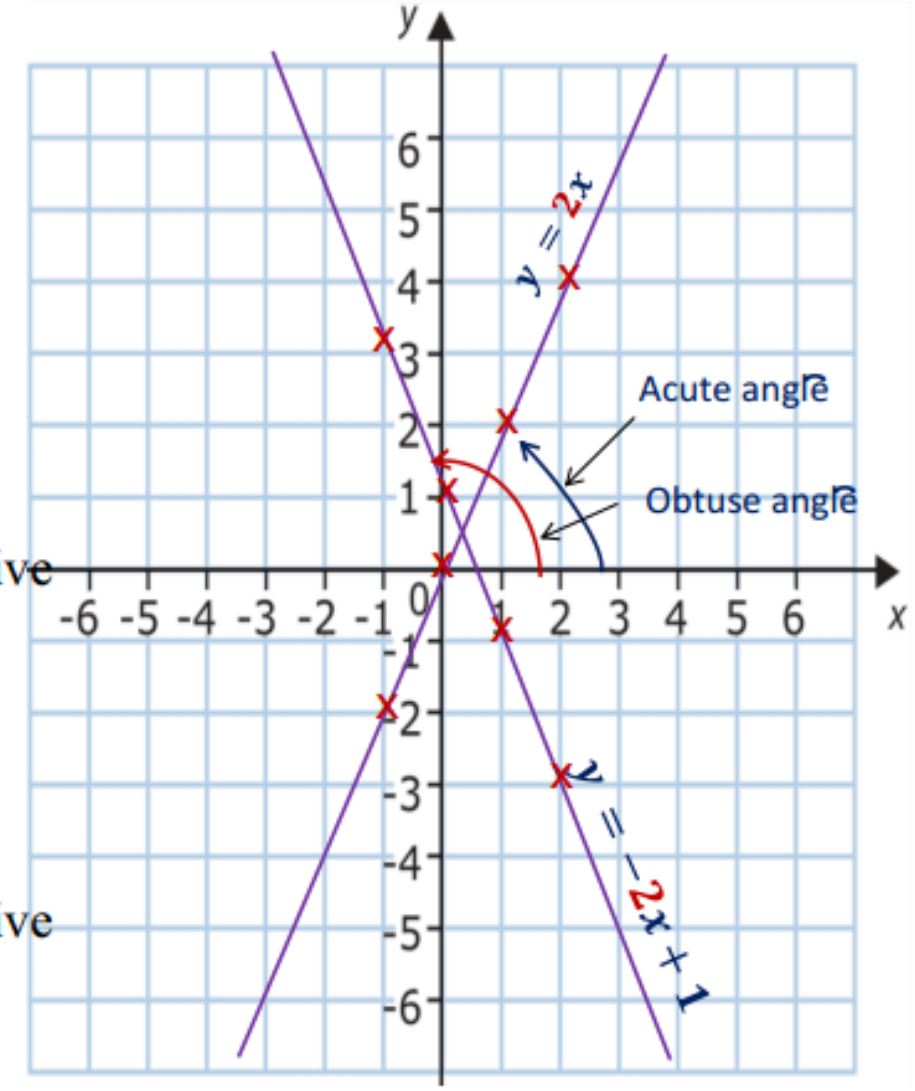
Let's observe graphs of the functions $y = 2x$ and $y = 2x + 3$

Straight lines of the graphs $y = 2x$ ***and*** $y = 2x + 3$ ***are parallel to each other***





Let's observe graphs of the functions $y = 2x$ and $y = -2x + 1$



- If gradient of a straight line.

  - will be a positive (+) value it makes acute angle counter clockwise with the positive direction of the x – axis.

  - will be a negative (-) value it makes acute angle counter clockwise with the positive direction of the x – axis.

Graphs of functions of the form $ax + by = c$

It is better to change the given equation to the form of $y = mx + c$

Ex;- :Express $4x + 2y = 6$ equation as the form of $y = mx + c$

$$4x + 2y = 6$$

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

$$\frac{2y}{2} = \frac{-4x}{2} + \frac{6}{2}$$

$$y = -2x + 3$$

1 For each of the functions given by the following equations,write the gradient and intercept without drawing the corresponding graphs and write whether the graph makes an acute or obtuse angle counterclockwise with the positive direction of x axis.

i) $y = 5x$ ii) $y = 2x + 5$ iii) $y = -5x - 4$ iii) $y = -x + 2$

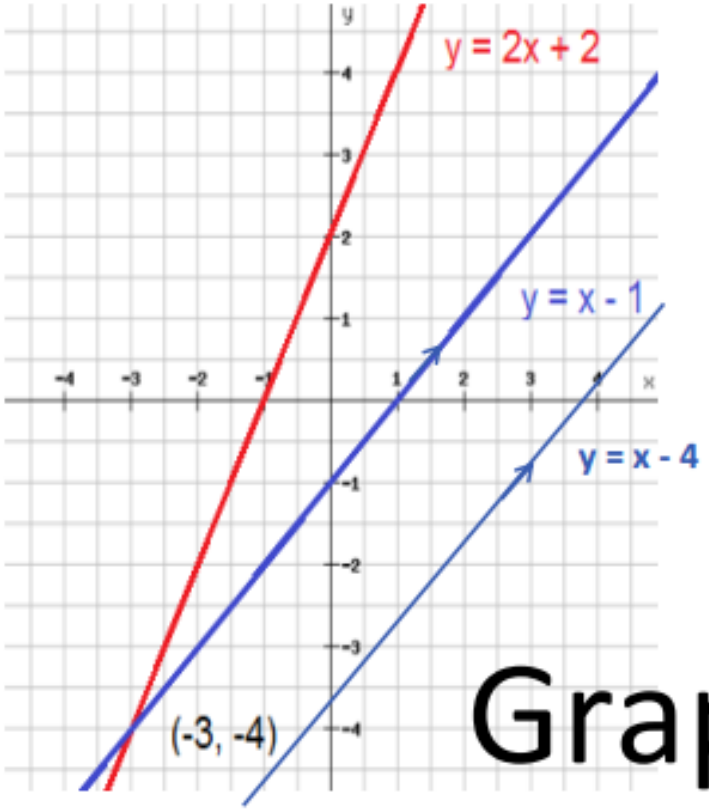
iv) $2y = -4x + 2$ v) $3y - 4x = 2$

2 By selecting suitable values for x, construct a table of values and draw the graphs of the following functions on the same coordinate plane.

i) $y = x$ ii) $y = -2x - 3$ iii) $y = \frac{1}{2}x + 1$ iv) $y = -\frac{1}{2}x - 3$

Mathematics

Unit 20



Graphs