Revision Notes

Class - 9 Mathematics

Chapter 4 - Linear Equation in Two Variable

Linear Equation in Two Variables:

- Any equation which can be written in the form $ax + by + c = 0$, where a, b and c are real numbers $a \neq 0$, $b \neq 0$ is called a **linear equation in two variables.**

- **An ordered pair** (x, y) is the solution of linear equation in two variable if this point satisfies the linear equation $ax + by + c = 0$.

- **Examples** of linear equation in two variables - $2x + 4y = 1$, $x - 10y = -5$, etc.

Solution of Linear Equation:

- A **linear equation** has a **unique solution** when there exist only one point which satisfies the linear equation.
  For example: Solution of $2x + 6 = 2$ is
  $2x + 6 = 2$
  $2x = 2 - 6$
  $2x = -4$
 $x = \dfrac{-4}{2}$
  $x = -2$

  In $2x + 6 = 2$ has only one variable x therefore x has unique solution. Also, geometrically it will be a point on rectangular axes whose ordinate will be 0

- A system of linear equation has unique solution when the system of lines intersects each other at only one point.

- A **linear equation in two variables** have **infinitely many solutions** means there are more than one ordered pair which satisfy the equation.

- For example: Solution of $2x + 3y = 12$ are

x	3	0	6
y	2	4	0

  The following value $(3, 2), (0, 4), (6, 0)$ of x and y satisfies the equation $2x + 3y = 12$ therefore they are the solutions of $2x + 3y = 12$.

- A system of linear equation has infinitely many solution if the system of lines coincides each other which means each point on the system of line will be the solution.
- For example: System of linear equations $-6x+4y=2$ and $3x-2y=-1$ have infinitely many solution because these two line coincides each other as shown in graph below

Graph of equation -6x+4y=2 and 3x-2y=-1
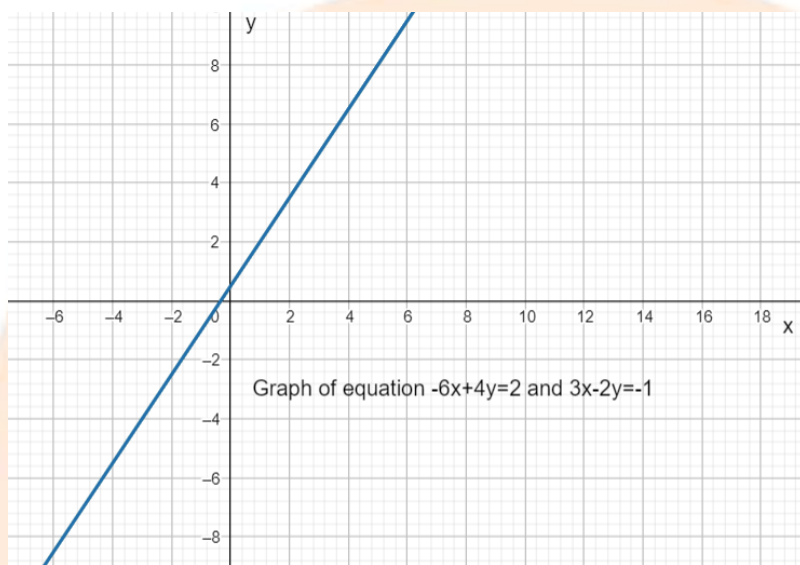
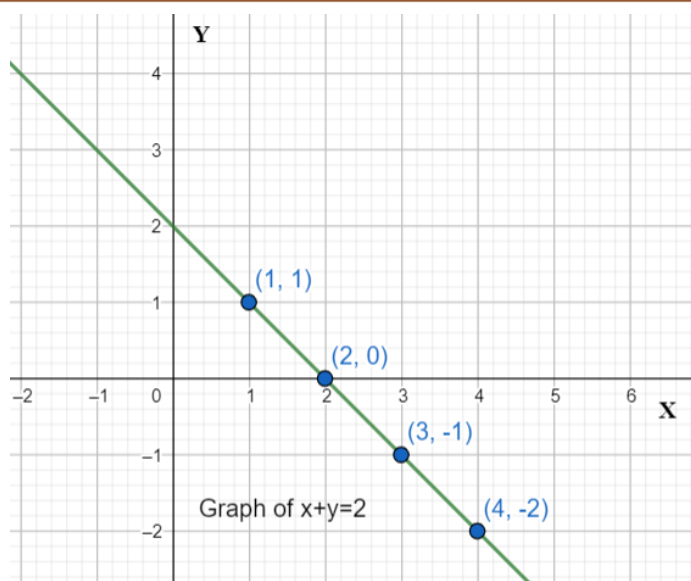**Graph of Linear Equation in Two Variables:**
- We know that linear equation in two variables can have infinitely many solutions and we get every solution in form of pair of values.
- So, we can plot these values on coordinate plane and draw the graph of linear equation in two variables.

  For e.g. – Let us draw the graph for the equation $x+y=2$

 Let us draw a table for the values of x and y

x	1	2	3	4
y	1	0	-1	-2

  Now, Plotting the values of x and y in the coordinate plane

Graph of x+y=2

- From the above graph we can see that geometrical representation of given equation is a straight line
- We can also conclude that **graph of every linear equation in two variables is a straight line.**

Equations of Line parallel to x-axis and y-axis:
- Linear equation in two variables is written as $ax+by+c=0$ if we put $y=0$, the equation becomes $ax+c=0.$ The Graph of equation $ax+c=0$ is a straight line **parallel to the y-axis.**
- On the other hand, if we put $x=0$ in $ax+by+c=0$, the equation becomes $by+c=0$. The Graph of equation $by+c=0$ is a straight line **parallel to the x-axis.**
- **Equation of x-axis is** $y=0$ because at x-axis y-coordinates are always zero and the coordinate form of any point on x-axis will be $(x,0)$
- **Equation of y-axis is** $x=0$ because at y-axis x-coordinates are always zero and the coordinate form of any point on y-axis will be $(0,y)$
- Graph below represents the equation of x-axis and y-axis
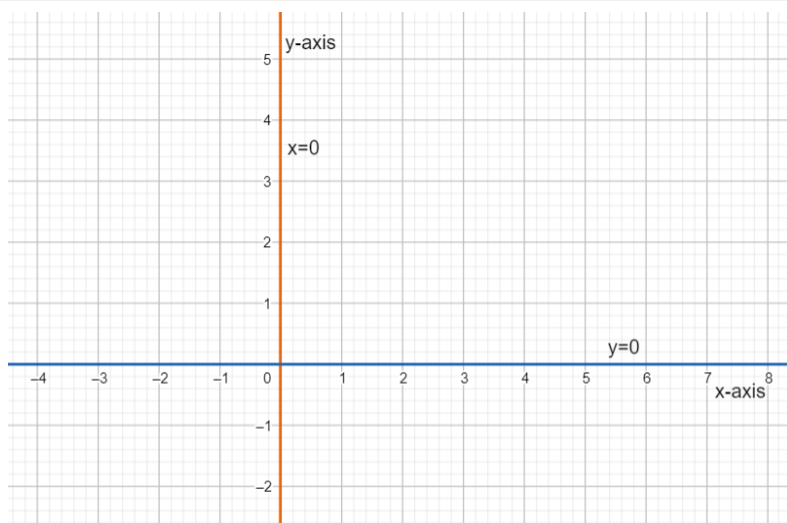
- If in a coordinate point (x, y) value of x is a **positive constant** then the point will lie on the **right side** of x-axis and if it is a **negative constant** then the point will lie on the **left side** of x-axis.
- Similarly, if the value of y is a **positive constant** then the point will lie on the **upper side** of y-axis and if it is negative constant then the point will lie on the **lower side** of x-axis.