

Co-ordinate Geometry

- Slope:
- $m = \tan \theta$ (when angle (θ) is given)
- $m = \frac{y_2 - y_1}{x_2 - x_1}$ (when two points of a line is given)
- $m = -\frac{a}{b}$ (when equation of line $ax + by + c = 0$ is given)

- Equation of a line:

1. Two point form: $l: \begin{vmatrix} x & y & 1 \\ x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \end{vmatrix} = 0$
2. Slope point form: $l: y_2 - y_1 = m(x_2 - x_1)$
3. General form: $l: ax + by + c = 0$

- Condition for parallel and perpendicular lines:
- If m_1 be slope of line l_1 and m_2 be slope of line l_2 then,
- For parallel lines: $m_1 = m_2$
- For perpendicular lines: $m_1 \cdot m_2 = -1$

- Equation of parallel and perpendicular lines to the given line:
- If an equation of line $ax + by + c = 0$ is given, then
 1. Equation of line parallel to the line $ax + by + c = 0$ is $ax + by + k = 0$
 2. Equation of line perpendicular to the line $ax + by + c = 0$ is $bx - ay + k' = 0$
- **For e.g.:** To find equation of line parallel to the $x + 5y + 3 = 0$ and passing through the point (4,3)

General equation of line parallel to the given line is

$$ax + by + k = 0$$

$$\text{i.e. } 1x + 5y + k = 0 \dots(1)$$

This line passes through the point (x, y)= (4,3)

$$\therefore 4 + 5(3) + k = 0$$

$$\therefore 4 + 15 + k = 0$$

$$\therefore 19 + k = 0$$

$$\therefore k = -19$$

Substituting the value of k in (1) is

$$x + 5y - 19 = 0$$

Which is the required equation of line.

- Equation of circle with centre $C(h, k)$ and radius r : $(x - h)^2 + (y - k)^2 = r^2$
- *General equation of circle with centre $C(-g, -f)$ and radius r is given by*

$$x^2 + y^2 + 2gx + 2fy + c = 0 \text{ where } g = -h, f = -k, c = \text{constant}$$

- To find centre and radius from general equation of circle:
- *For the general equation of circle $x^2 + y^2 + 2gx + 2fy + c = 0$,*
- Centre: $C = (-g, -f)$
- Radius: $r = \sqrt{g^2 + f^2 - c}$