Equation of a Line

Important Concepts

1. The angle which a straight line makes with the positive direction of x-axis measured in the anticlockwise direction is called the inclination (or angle of inclination) of the line. The inclination is usually denoted by θ.
2. If θ is the inclination of a line l, then tan θ is called the slope or gradient of the line l.
3. The slope of a line whose inclination is 90° is not defined.
4. The slope of x-axis is zero and slope of y-axis is not defined.
5. Three points A, B and C are collinear if Slope of AB = slope of BC.
6. Let AB be a line cutting x-axis and the y-axis at A(a, 0) and B(0, b) respectively. Then the intercepts made on the axes are a and b respectively. That is, x-intercept = a and y-intercept = b.
7. The equation of line parallel to x-axis at a distance a in the positive direction of y-axis is y = a and in negative direction of y-axis is y = -a.

Slope of a line

The slope m of the line through the points (x_1, y_1) and (x_2, y_2) is given by $m = \frac{y_2 - y_1}{x_2 - x_1}$.

Parallel and Perpendicular Lines

1. Two non-vertical lines l and m are parallel if and only if their slopes are equal.
   That is $m_1 = m_2$
2. Two non-vertical lines are perpendicular to each other if and only if their slopes are negative reciprocals of each other.
   That is $m_2 = \frac{-1}{m_1} \Rightarrow m_1 \times m_2 = -1$

Condition for Collinearity of Points

Three points A, B and C are collinear if **Slope of AB = slope of BC**

Equation of coordinate axes

1. The equation of x-axis is y = 0
2. The equation of y-axis is x = 0

Various Forms of the Equations of Straight Lines

Slope-intercept form: The equation of a line having slope m and y-intercept c is given by **y = mx + c**.

Point-Slope form: The equation of a line passing through (x_1, y_1) and having slope m is given by

$$y - y_1 = m(x - x_1).$$

Two-point form: The equation of line passing through two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given by

$$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$