

Equation of Line passing through two given points.

(i) **Cartesian form:** If $A(x_1, y_1, z_1), B(x_2, y_2, z_2)$ be two given points, the equations to the line AB are

$$\frac{x - x_1}{x_2 - x_1} = \frac{y - y_1}{y_2 - y_1} = \frac{z - z_1}{z_2 - z_1}$$

The co-ordinates of a variable point on AB can be expressed in terms of a parameter λ in the form

$$x = \frac{\lambda x_2 + x_1}{\lambda + 1}, y = \frac{\lambda y_2 + y_1}{\lambda + 1}, z = \frac{\lambda z_2 + z_1}{\lambda + 1}$$

λ being any real number different from -1 . In fact, (x, y, z) are the co-ordinates of the point which divides the join of A and B in the ratio $\lambda : 1$.

(ii) **Vector form :** The vector equation of a line passing through two points with position vectors **a** and **b** is

$$\mathbf{r} = \mathbf{a} + \lambda(\mathbf{b} - \mathbf{a})$$

