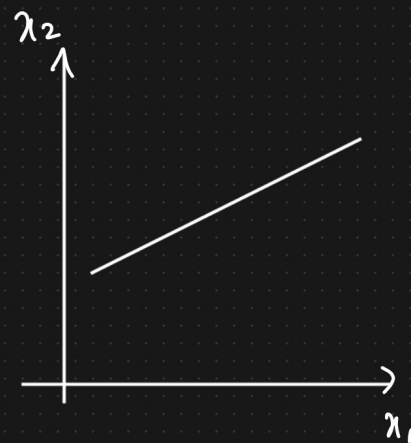
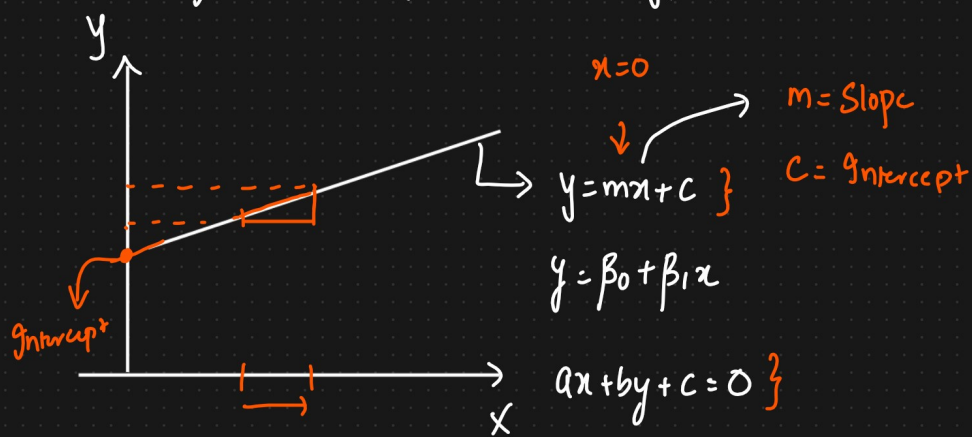


# Equation of Line, 3d plane and Hyperplane (n Dimension)



$$by + c = -ax$$

$$by = -ax - c$$

$$w_1 x_1 + w_2 x_2 + b = 0$$

$$\boxed{w^T x + b = 0}$$

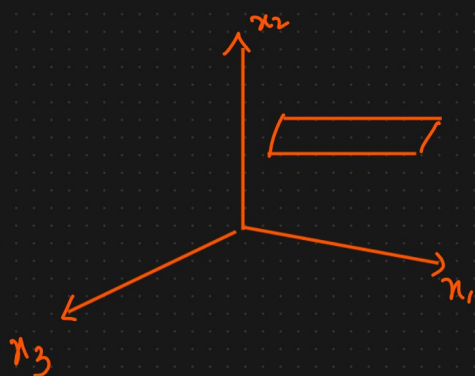


$$y = mx + c \quad \Leftarrow \quad y = \underbrace{\left[ \frac{-a}{b} \right]}_m x - \underbrace{\left[ \frac{c}{b} \right]}_{\rightarrow c} \quad \text{Eq of a straight line}$$

## n-Dimension plane

$$w_1 x_1 + w_2 x_2 + w_3 x_3 + \dots + w_n x_n + b = 0$$

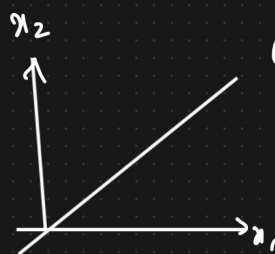
$$\boxed{w^T x + b = 0}$$



$$w_1 x_1 + w_2 x_2 + w_3 x_3 + b = 0$$

$$\boxed{w^T x + b = 0}$$

$$w = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix} \cdot x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$



$$w_1 x_1 + w_2 x_2 + b = 0$$

$$w_1 x_1 + w_2 x_2 = 0$$

$$\boxed{w^T x = 0}$$

Equation of a straight  
passing through an  
origin

$$\boxed{w^T x = 0}$$

$$\text{Equation of a plane} = \hat{\Pi}_n : w^T x = 0$$

$$\begin{bmatrix} w_1 \\ w_2 \\ w_3 \\ \vdots \\ w_n \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ \vdots \\ x_n \end{bmatrix}$$

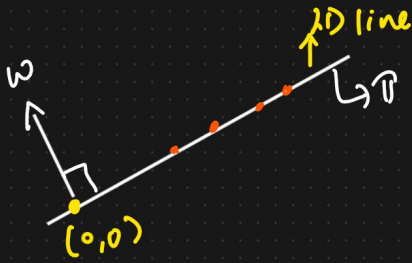


$$w^T x = 0$$

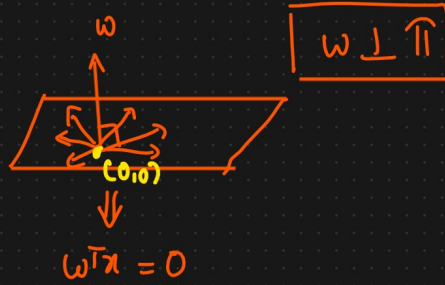
$$w \cdot x = w^T x = \|w\| \|x\| \cos \theta = 0$$

$$\theta = 90$$

$$\cos \theta = 0$$



$$\text{intercept} = 0$$



$$w \perp \Pi$$