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

$x = 0$

$M = $ Slope

$C = $ Intercept

$y = mx + c$ }

$y = \beta_0 + \beta_1 x$

intercept

$ax + by + c = 0$ }

$by + c = -ax$

$by = -ax - c$

$y = mx + c$ $\Leftarrow$ $y = \boxed{\dfrac{-a}{b}} x - \boxed{\dfrac{c}{b}} \to c$ Eq of a straight line

$\downarrow$
m

$w_1 x_1 + w_2 x_2 + b = 0$

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

$\Downarrow$
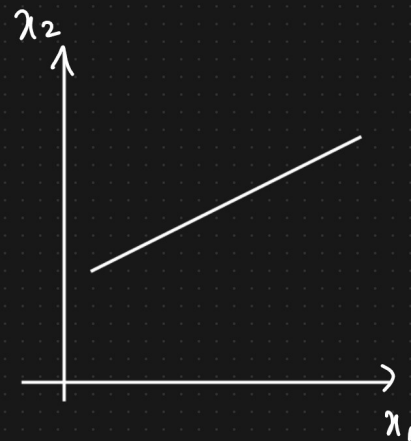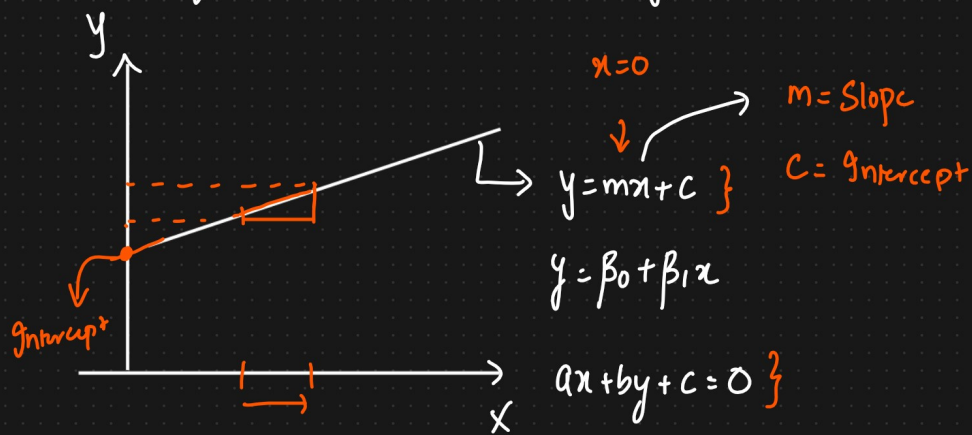
Eq of a straight line

n-Dimension plane

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

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

$w_1 x_1 + w_2 x_2 + w_3 x_3 + b = 0$
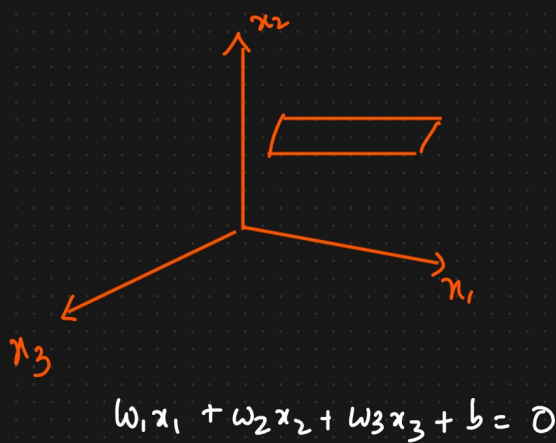
$$\boxed{w^T x + b = 0}$$

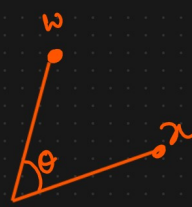$w = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix} \cdot x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$

$w_1 x_1 + w_2 x_2 + b = 0$

$w_1 x_1 + w_2 x_2 = 0$
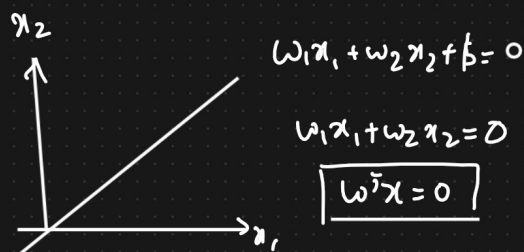
$$\boxed{w^T x = 0}$$

Equation of a straight plane passing through an origin

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

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

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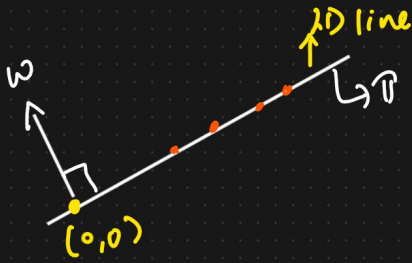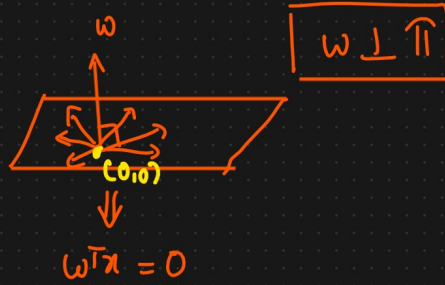

$$w^T x = 0$$

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

$$\theta = 90$$

$$\cos\theta = 0$$

2D line

$\rightarrow \pi$

w

$(0,0)$

intercept = 0

$$\boxed{w \perp \pi}$$

w

$(0,0)$

$$w^T x = 0$$