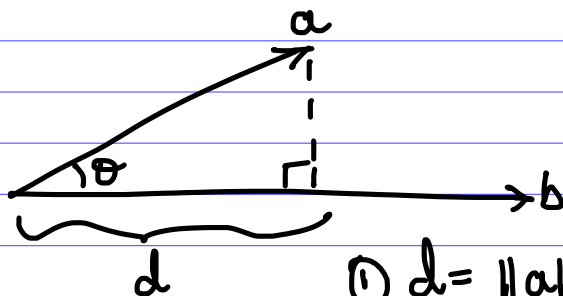
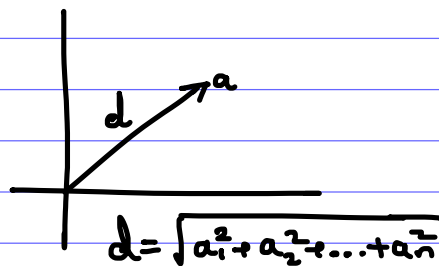


$$\begin{aligned}
 a \cdot a &= a_1 a_1 + a_2 a_2 + \dots + a_n a_n \\
 &= a_1^2 + a_2^2 + \dots + a_n^2 \\
 &= \|a\|_2^2
 \end{aligned}$$



$$\textcircled{1} d = \|a\|_2 \cos \theta \quad \textcircled{2} a \cdot b = \|a\| \|b\| \cos \theta$$

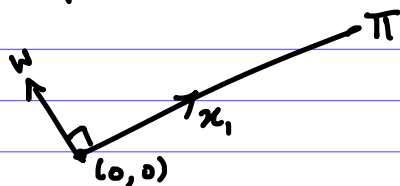
$$d = \frac{a \cdot b}{\|b\|} = a \cdot \hat{b}$$

unit vector in the direction of b
 $\|\hat{b}\| = 1.$

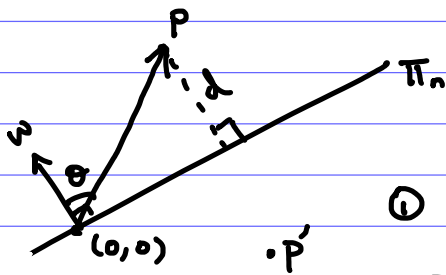
n -dim hyperplane: $\Pi_n: w_0 + \vec{w}^T x = 0$; $\vec{w}^T x = 0$

If $w \perp \Pi$ then $w \cdot x_i = 0 \quad \forall x_i \in \Pi$

↑
plane passing through origin



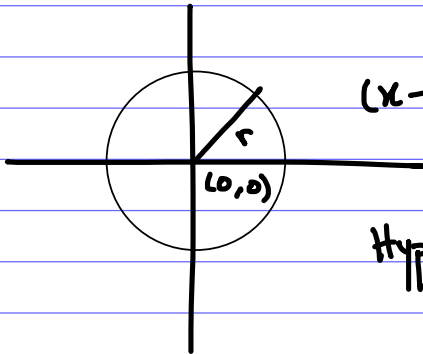
w is a vector \perp to Π at origin.



① $d = \|P\| \cos \theta$ ② $w \cdot P = \|w\| \|P\| \cos \theta$

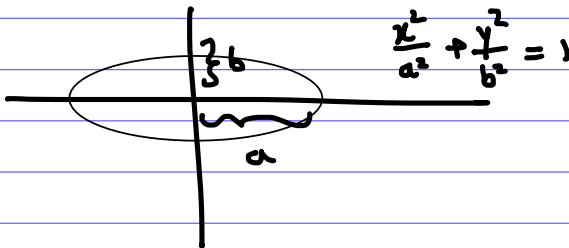
$$\boxed{d = \frac{w \cdot P}{\|w\|} = \frac{w^T P}{\|w\|}} \rightarrow \text{take absolute value}$$

$\frac{w \cdot P}{\|w\|} = \text{rve}$ $\frac{w \cdot P}{\|w\|} = -\text{ve}$



$$(x-h)^2 + (y-k)^2 = r^2$$

Hyper-sphere: $\sum_{i=1}^n x_i^2 = r^2$



$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$