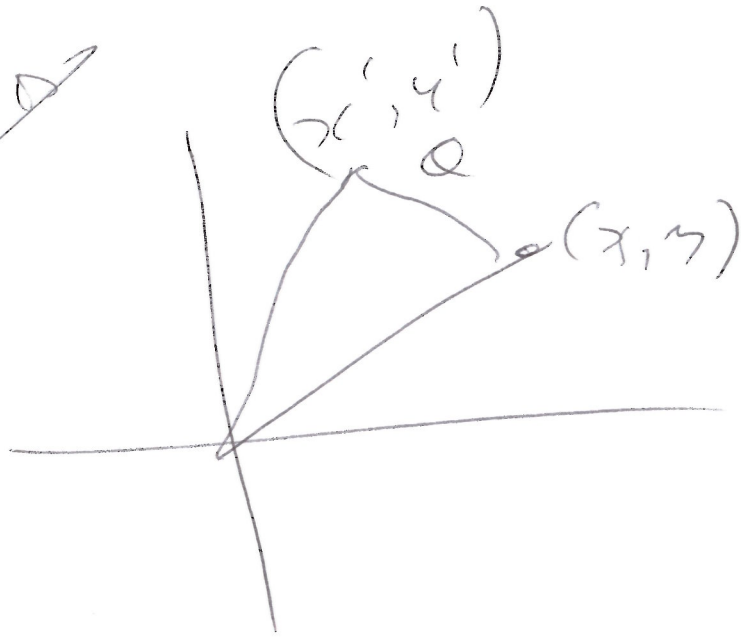


ROTATE IN 3D

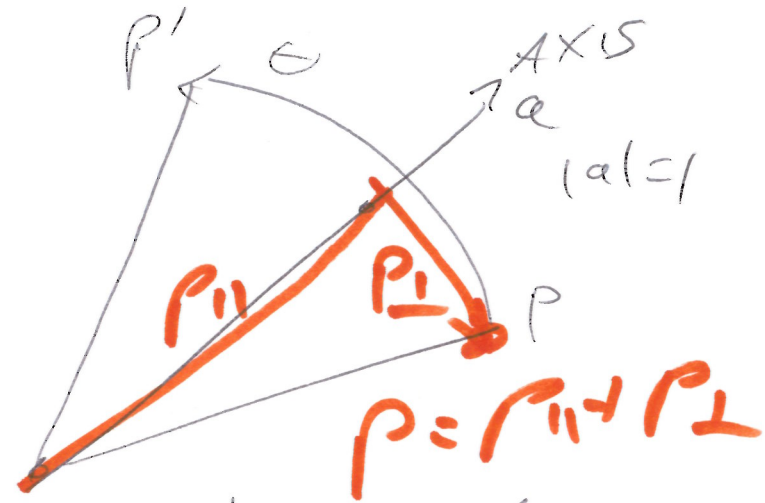
2D



$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$

3D

\vec{a} ($|\vec{a}|=1$)

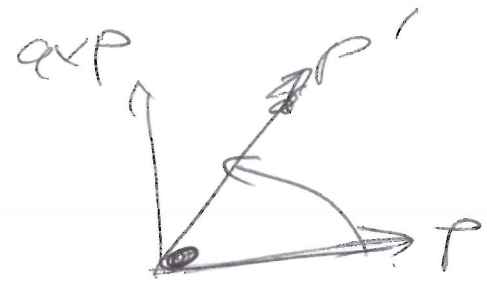


$$P = P_{\parallel} + P_{\perp}$$

IF $P \parallel a$ $P' = P$
 $\theta = 0$

IF $P \perp a$, THIS IS
 A 2D PROBLEM.

LOOK DOWN AXIS



$$P' = P \cos \theta + \text{axp} \sin \theta$$



$$P_{||} = p \cdot a \cdot a$$

$$P_{\perp} = p - P_{||} = p - p \cdot a \cdot a$$

$$P_{||}' = P_{||} = p \cdot a \cdot a$$

$$P_{\perp}' = P_{\perp} \cos \theta + a \times P_{\perp} \sin \theta$$

$$a \times P_{\perp} = a \times p - \cancel{p \cdot a \cdot a \times a}$$

$$P_{\perp}' = P_{\perp} \cos \theta + a \times p \sin \theta$$

$$= (p - p \cdot a \cdot a) \cos \theta + a \times p \sin \theta$$

$$P' = P_{||}' + P_{\perp}'$$

$$= p \cdot a \cdot a + (p - p \cdot a \cdot a) \cos \theta + a \times p \sin \theta$$

$$P' = p \cos \theta + p \cdot a \cdot a (1 - \cos \theta) + a \times p \sin \theta$$

$a = \text{AXIS}$ $|a| = 1$

$p = \text{ORIG PT}$

$\theta = \text{ANGLE}$

$P' = \text{ROTATED PT}$