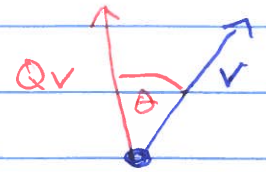
What is the 2×2 matrix Q for rotation by angle θ in the plane?

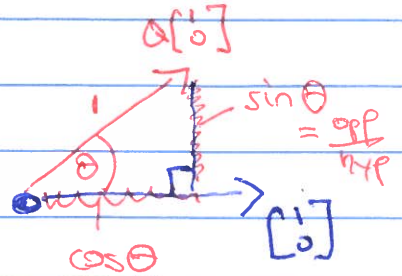
$$Q\begin{bmatrix}1\\0\end{bmatrix} = 1^{st} \text{ col of } Q$$

$$= \begin{bmatrix}\cos\theta\\ \sin\theta\end{bmatrix}$$

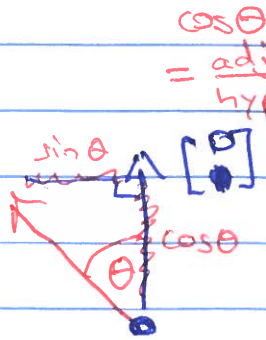


$$Q\begin{bmatrix}0\\1\end{bmatrix} = 2^{nd} \text{ col of } Q$$

$$= \begin{bmatrix}-\sin\theta\\ \cos\theta\end{bmatrix}$$



$$\Rightarrow Q = \begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{bmatrix}$$



- Q orthogonal matrix
- $\det(Q) = \cos^2\theta + \sin^2\theta = 1$