Assignment 4

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The link to the solution is

https://github.com/Adarsh1310/EE5609

***Abstract*—This documents solves a problem based on determinant.**

1 Problem

Show That

Prove that $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ is independent of θ

2 Solution

Now, Solving the determinant:-

$$\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix} \tag{2.0.1}$$

$$\begin{vmatrix} x-\sin\theta\cos\theta & 0 & \cos\theta - x\sin\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix} (\mathbf{R}_1 - \sin\theta\mathbf{R}_3) \tag{2.0.2}$$

$$\begin{vmatrix} x-\sin\theta\cos\theta & 0 & \cos\theta - x\sin\theta \\ -\sin\theta + x\cos\theta & 0 & 1+x^2 \\ 0 & 1 & 0 \end{vmatrix} (\mathbf{C}_1 - \cos\theta\mathbf{C}_2 and \mathbf{C}_3 - x\mathbf{C}_2) \tag{2.0.3}$$

Solving determinant 2.0.3

$= -1[(x-\sin\theta\cos\theta)(1+x^2) - (\cos\theta - x\sin\theta)(\sin\theta + x\cos\theta)]$

$= -x^3$

Hence, the determinant is independent of θ.