

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

$$\begin{vmatrix} x & \sin \theta & \cos \theta \\ -\sin \theta & -x & 1 \\ \cos \theta & 1 & x \end{vmatrix} \quad (2.0.1)$$

Now, Solving the determinant:-

$$\begin{aligned} &= x(-x^2 - 1) - \sin \theta(-x \sin \theta - \cos \theta) \\ &\quad + \cos \theta(-\sin \theta + x \cos \theta) \\ &= -x^3 - x + x \sin^2 \theta + \sin \theta \cos \theta \quad (2.0.2) \\ &\quad - \sin \theta \cos \theta + x \cos^2 \theta \end{aligned}$$

$$= -x^3 - x + x \sin^2 \theta + x \cos^2 \theta \quad (2.0.3)$$

$$= -x^3 (\because \sin^2 \theta + \cos^2 \theta = 1) \quad (2.0.4)$$

Hence, the determinant is independent of θ .