

Matrix Theory Assignment 3

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Abstract—This document contains the solution to problem No.3.10.11

1 PROBLEM

Evaluate the following: $\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 5 & 9 & 86 \end{vmatrix} = 0$

2 SOLUTION

Given determinant: $\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 5 & 9 & 86 \end{vmatrix} = 0$

Applying : $C_3 \leftarrow C_3 - C_1$

$$\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 5 & 9 & 86 \end{vmatrix} \leftrightarrow \begin{vmatrix} 2 & 7 & 65-2 \\ 3 & 8 & 75-3 \\ 5 & 9 & 86-5 \end{vmatrix} \quad (2.0.1)$$

Simplified (2.0.1) So, C_3 can be written as,

$$\begin{vmatrix} 2 & 7 & 63 \\ 3 & 8 & 72 \\ 5 & 9 & 81 \end{vmatrix} \leftrightarrow \begin{vmatrix} 2 & 7 & 9 \times 7 \\ 3 & 8 & 9 \times 8 \\ 5 & 9 & 9 \times 9 \end{vmatrix} \quad (2.0.2)$$

Taking out 9 common from C_3

$$\begin{vmatrix} 2 & 7 & 63 \\ 3 & 8 & 72 \\ 5 & 9 & 81 \end{vmatrix} = 9 \begin{vmatrix} 2 & 7 & 7 \\ 3 & 8 & 8 \\ 5 & 9 & 9 \end{vmatrix} \quad (2.0.3)$$

Since C_2 and C_3 are identical in 2.0.3, So $9 \times 0 = 0$, Determinant is zero.

Note: If any two row or column of determinant are **identical**, then value of determinant is zero.

Python Code:

<https://github.com/ayushkesh/Matrix-Theory-EE5609/blob/master/A2/codes/A3.ipynb>

Latex codes:

<https://github.com/ayushkesh/Matrix-Theory-EE5609/blob/master/A2/latex/A3.tex>