Matrix Theory (EE5609) Assignment 3

Utkarsh Shashikant Surwade

Abstract—This document contains the solution to find the determinant of a matrix using properites of determinants

Download all python codes from

https://github.com/utkarshsurwade/
Matrix_Theory_EE5609/tree/master/codes

and latex-tikz codes from

https://github.com/utkarshsurwade/
Matrix_Theory_EE5609/tree/master/
Assignment3

1 PROBLEM

By Using properties of determinants,show that

$$\begin{vmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix} = (5x+4)(4-x)^2 \quad (1.0.1)$$

2 SOLUTION

$$\begin{vmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix} \xleftarrow{R_1 \leftarrow R_1 + R_2 + R_3} \quad (2.0.1)$$

$$(5x+4)\begin{vmatrix} 1 & 1 & 1 \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix} \xleftarrow[C_2 \leftarrow C_2 - C_3]{C_1 \leftarrow C_1 + C_2} \quad (2.0.2)$$

$$(5x+4)\begin{vmatrix} 0 & 0 & 1 \\ x-4 & 4-x & 2x \\ 0 & x-4 & x+4 \end{vmatrix} \quad (2.0.3)$$

$$(5x+4)(4-x)^2\begin{vmatrix} 0 & 0 & 1 \\ -1 & 1 & 2x \\ 0 & -1 & x+4 \end{vmatrix} \quad (2.0.4)$$

Therefore finding the determinant along Row1:

$$= (5x+4)(4-x)^2 \quad (2.0.5)$$