Assignment 4

Sachinkumar Dubey - EE20MTECH11009

Download all python codes from

```
https://github.com/sachinomdubey/Matrix−theory/
    Assignment4/codes
```

and latex-tikz codes from

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https://github.com/sachinomdubey/Matrix−theory/
    Assignment4
```

0.1 Problem

(Section 3.10) 12. Show that:

$$\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} = 0 \tag{0.1.1}$$

0.2 Solution

Given determinant:

$$\Delta = \begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} \tag{0.2.1}$$

Applying transformation:

$$\Delta = \begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} \tag{0.2.2}$$

$$= \begin{vmatrix} 1 & bc & ab+ac \\ 1 & ca & bc+ab \\ 1 & ab & ac+bc \end{vmatrix} \tag{0.2.3}$$

$$\xleftrightarrow{C_3 \leftarrow C_3 + C_2} \begin{vmatrix} 1 & bc & ab+ac+bc \\ 1 & ca & bc+ab+ca \\ 1 & ab & ac+bc+ab \end{vmatrix} \tag{0.2.4}$$

Taking (ab+bc+ac) common from C3:

$$\Delta = (ab+bc+ac) \begin{vmatrix} 1 & bc & 1 \\ 1 & ca & 1 \\ 1 & ab & 1 \end{vmatrix} \tag{0.2.5}$$

If any two row or column of determinant is same, then the value of determinant is zero:

$$\Delta = (ab+bc+ac) \begin{vmatrix} 1 & bc & 1 \\ 1 & ca & 1 \\ 1 & ab & 1 \end{vmatrix} = 0 \tag{0.2.6}$$

$$\therefore \begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} = 0 \tag{0.2.7}$$

Hence proved.