Assignment 3

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Download all python codes from

https://github.com/jvinaykumar12/EE5609/tree/master/Assignment3

and latex codes from

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1 Problem

Solve the equation

$$\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix} = 0 \ , \ a \neq 0.$$

2 Explanation

Given,

$$\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix} \xleftrightarrow{R_3 \leftarrow R_1+R_2+R_3} \tag{2.0.1}$$

$$\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ 3x+a & 3x+a & 3x+a \end{vmatrix} = (3x+a) \begin{vmatrix} x+a & x & x \\ x & x+a & x \\ 1 & 1 & 1 \end{vmatrix} \tag{2.0.2}$$

If any two rows or columns of determinent are identical (or) any row or column is zero, then the value of the determinent is zero. Since a should not be equal to zero we can't make any two rows idenical or any row to be zero, therefore 3x+a should be zero for the determinent to be zero.

$$3x + a = 0 \tag{2.0.3}$$

$$\implies a = -3x \tag{2.0.4}$$

Therefore, when the value of a is $-3x$ then

$$\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix} = 0$$