Assignment 4

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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,

$$\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix} \tag{2.0.1}$$

$$\xleftrightarrow{R_3 \leftarrow R_3 - R_1} \begin{vmatrix} x+a & x & x \\ x & x+a & x \\ -a & 0 & a \end{vmatrix} \tag{2.0.2}$$

$$\xleftrightarrow{R_2 \leftarrow R_2 - R_1} \begin{vmatrix} x+a & x & x \\ -a & a & 0 \\ -a & 0 & a \end{vmatrix} \tag{2.0.3}$$

By expanding determinant along the first column

$$\implies (x+a)a^2 + xa^2 + xa^2 = 0 \tag{2.0.4}$$

$$\implies (x+a)a^2 + (2x)a^2 = 0 \tag{2.0.5}$$

$$\implies 3x + a = 0 \tag{2.0.6}$$

$$\implies a = -3x \tag{2.0.7}$$

Therefore from equation 2.0.6, when the value of a is $-3x$ then

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