

# 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,

$$\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix} \quad (2.0.1)$$

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

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

By expanding determinant along the first column

$$\Rightarrow (x+a)a^2 + xa^2 + xa^2 = 0 \quad (2.0.4)$$

$$\Rightarrow (x+a)a^2 + (2x)a^2 = 0 \quad (2.0.5)$$

$$\Rightarrow 3x + a = 0 \quad (2.0.6)$$

$$\Rightarrow a = -3x \quad (2.0.7)$$

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

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