Assignment 3

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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,

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

$$\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ 3x+a & 3x+a & 3x+a \end{vmatrix} \quad (2.0.2)$$

Since determinent is zero we can write the element in last row as

$$3x + a = 0 \qquad (2.0.3)$$
$$\implies a = -3x \qquad (2.0.4)$$

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

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