5.2.62

EE25BTECH11060 - V.Namaswi

Question Solve system of linear equations

$$3x - 2y + 3z = 8$$
$$2x + y - z = 1$$
$$4x - 3y + 2z = 4$$

Solution
According to question the Equations of line given are

$$\begin{pmatrix} 3 & -2 & 3 \end{pmatrix} X = 8 \tag{1}$$

$$\begin{pmatrix} 2 & 1 & -2 \end{pmatrix} X = 1 \tag{2}$$

$$\begin{pmatrix} 4 & -3 & 2 \end{pmatrix} X = 4 \tag{3}$$

$$\begin{pmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{pmatrix} X = \begin{pmatrix} 8 \\ 1 \\ 4 \end{pmatrix} \tag{4}$$

Forming Argumented Matrix

$$\left(\begin{array}{ccc|c} 3 & -2 & 3 & 8 \\ 2 & 1 & -1 & 1 \\ 4 & -3 & 2 & 4 \end{array} \right). \tag{5}$$

Replace

$$R_1 \rightarrow \tfrac{1}{3}R_3$$

$$\left(\begin{array}{ccc|c} 1 & -\frac{2}{3} & 1 & \frac{8}{3} \\ 2 & 1 & -1 & 1 \\ 4 & -3 & 2 & 4 \end{array} \right) \tag{6}$$

Replace

$$R_2 \rightarrow R_2 - 2R_1, \quad R_3 \rightarrow R_3 - 4R_1$$

$$\left(\begin{array}{ccc|c} 1 & -\frac{2}{3} & 1 & \frac{8}{3} \\ 0 & \frac{7}{3} & -3 & -\frac{13}{3} \\ 0 & -\frac{1}{3} & -2 & -\frac{20}{3} \end{array} \right) \tag{7}$$

Replace

$$R_2 \to \tfrac{3}{7}R_2$$

$$\begin{pmatrix} 1 & -\frac{2}{3} & 1 & \bigg| & \frac{8}{3} \\ 0 & 1 & -\frac{9}{7} & \bigg| & -\frac{13}{7} \\ 0 & -\frac{1}{3} & -2 & \bigg| & -\frac{20}{3} \end{pmatrix} \tag{8}$$

Replace

$$R_1 \to R_1 + \tfrac{2}{3}R_2, \quad R_3 \to R_3 + \tfrac{1}{3}R_2$$

$$\begin{pmatrix} 1 & 0 & \frac{5}{21} & \bigg| & \frac{22}{21} \\ 0 & 1 & -\frac{9}{7} & \bigg| & -\frac{13}{7} \\ 0 & 0 & -\frac{41}{21} & \bigg| & -\frac{143}{21} \end{pmatrix} \tag{9}$$

Replace

$$R_3 \to -\tfrac{21}{41}R_3$$

$$\begin{pmatrix} 1 & 0 & \frac{5}{21} & \bigg| & \frac{22}{21} \\ 0 & 1 & -\frac{9}{7} & \bigg| & -\frac{13}{7} \\ 0 & 0 & 1 & \bigg| & \frac{143}{41} \end{pmatrix} \tag{10}$$

Replace

$$R_1 \to R_1 - \tfrac{5}{21}R_3, \quad R_2 \to R_2 + \tfrac{9}{7}R_3$$

$$\begin{pmatrix} 1 & 0 & 0 & \bigg| & \frac{62}{123} \\ 0 & 1 & 0 & \bigg| & \frac{110}{287} \\ 0 & 0 & 1 & \bigg| & \frac{143}{41} \end{pmatrix} \tag{11}$$

Hence,

$$\mathbf{X} = \begin{pmatrix} \frac{62}{123} \\ \frac{110}{287} \\ \frac{143}{41} \end{pmatrix} \tag{12}$$

3 Planes: 3x-2y+3z=8, 2x+y-z=1, 4x-3y+2z=4