ASSIGNMENT -2

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Problem 1: Using matrices,solve the following system of equations:-

$$\begin{aligned} 2x - 3y + 5z &= 11 \\ 3x + 2y - 4z &= -5 \\ x + y - 2z &= -3 \end{aligned}$$

Solution:-

1. Three equations provided in the question are:-

$$2x - 3y + 5z = 11 \tag{1}$$
$$3x + 2y - 4z = -5 \tag{2}$$
$$x + y - 2z = -3 \tag{3}$$

The augmented matrix of the system :-

$$\begin{pmatrix} 2 & -3 & 5 & 11 \\ 3 & 2 & -4 & -5 \\ 1 & 1 & -2 & -3 \end{pmatrix} \tag{4}$$

Reduction of augmented into row reduced matrix,

$$R_1 \to R_1 - R_3 \tag{5}$$
$$\begin{pmatrix} 1 & -4 & 7 & 14 \\ 3 & 2R & -4 & -5 \\ 1 & 1 & -2 & -3 \end{pmatrix} \tag{6}$$
$$R_2 \to R_2 - 3R_3 \tag{7}$$
$$\begin{pmatrix} 1 & -4 & 7 & 14 \\ 0 & -1 & 2 & 4 \\ 1 & 1 & -2 & -3 \end{pmatrix} \tag{8}$$
$$R_3 \to R_3 + R_2 \tag{9}$$
$$\begin{pmatrix} 1 & -4 & 7 & 14 \\ 0 & -1 & 2 & 4 \\ 1 & 1 & -2 & -3 \end{pmatrix} \tag{10}$$
$$R_3 \to R_3 - R_1 \tag{11}$$
$$\begin{pmatrix} 1 & -4 & 7 & 14 \\ 0 & -1 & 2 & 4 \\ 0 & 5 & -9 & -17 \end{pmatrix} \tag{12}$$
$$R_3 \to R_3 + 5R_2 \tag{13}$$
$$\begin{pmatrix} 1 & -4 & 7 & 14 \\ 0 & -1 & 2 & 4 \\ 0 & 0 & 1 & 3 \end{pmatrix} \tag{14}$$
$$R_2 \to R_2 - R_3 \tag{15}$$
$$\begin{pmatrix} 1 & -4 & 7 & 14 \\ 0 & -1 & 1 & 1 \\ 0 & 0 & 1 & 3 \end{pmatrix} \tag{16}$$
$$R_2 \to -R_2 \tag{17}$$
$$\begin{pmatrix} 1 & -4 & 7 & 14 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 1 & 3 \end{pmatrix} \tag{18}$$
$$R_2 \to R_2 + R_3, weget \tag{19}$$
$$\begin{pmatrix} 1 & -4 & 7 & 14 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{pmatrix} \tag{20}$$
$$R_1 \to R_1 + 4R_2 \tag{21}$$
$$\begin{pmatrix} 1 & 0 & 7 & 22 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{pmatrix} \tag{22}$$

$$R_1 \to R_1 - 7R_3 \tag{23}$$

$$\begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{pmatrix} \tag{24}$$

By rewriting the system using row reduced matrix, we get x=1, y=2, z=3

$\therefore$ Solutions of the given equations are $x = 1$,$y = 2$and $z = 3$.