

## Answer on Question #85777 – Math – Linear Algebra

### Question

Solve the system of equations

$$3x + 2y + 4z = 7$$

$$2x + y + z = 1$$

$$x + 3y + 5z = 2$$

with partial pivoting. Store the multipliers and also write the pivoting vectors.

### Solution

$$3x + 2y + 4z = 7$$

$$2x + y + z = 1$$

$$x + 3y + 5z = 2$$

$$\begin{pmatrix} 3^* & 2 & 4 & 7 \\ 2 & 1 & 1 & 1 \\ 1 & 3 & 5 & 2 \end{pmatrix} \xrightarrow{\frac{1}{3}R_1} \begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 2 & 1 & 1 & 1 \\ 1 & 3 & 5 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 2 & 1 & 1 & 1 \\ 1 & 3 & 5 & 2 \end{pmatrix} \xrightarrow{R_2 - 2R_1} \begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & -1/3 & -5/3 & -11/3 \\ 1 & 3 & 5 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & -1/3 & -5/3 & -11/3 \\ 1 & 3 & 5 & 2 \end{pmatrix} \xrightarrow{R_3 - R_1} \begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & -1/3 & -5/3 & -11/3 \\ 0 & 7/3 & 11/3 & -1/3 \end{pmatrix}$$

$$\begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & -1/3 & -5/3 & -11/3 \\ 0 & 7/3 & 11/3 & -1/3 \end{pmatrix} \xrightarrow{-3R_2} \begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & 1 & 5 & 11 \\ 0 & 7/3 & 11/3 & -1/3 \end{pmatrix}$$

$$\begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & 1 & 5 & 11 \\ 0 & 7/3 & 11/3 & -1/3 \end{pmatrix} \xrightarrow{R_3 - \frac{7}{3}R_2} \begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & 1 & 5 & 11 \\ 0 & 0 & -8 & -26 \end{pmatrix}$$

$$\begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & 1 & 5 & 11 \\ 0 & 0 & -8 & -26 \end{pmatrix} \xrightarrow{-\frac{1}{8}R_3} \begin{pmatrix} 1^* & 2/3 & 4/3 & 7/3 \\ 0 & 1 & 5 & 11 \\ 0 & 0 & 1 & 13/4 \end{pmatrix}$$

$$z = \frac{13}{4}$$

$$y = 11 - 5z = 11 - 5\left(\frac{13}{4}\right) = -\frac{21}{4}$$

$$x = \frac{7}{3} - \frac{2}{3}y - \frac{4}{3}z = \frac{7}{3} - \frac{2}{3}\left(-\frac{21}{4}\right) - \frac{4}{3}\left(\frac{13}{4}\right) = \frac{3}{2}$$

**Answer:**

$$(x, y, z) = \left(\frac{3}{2}, -\frac{21}{4}, \frac{13}{4}\right).$$