

**Answer on Question # 40856 – Math – Linear Algebra:**

Solve the set of linear equations by Gaussian elimination method:

$$\begin{cases} a + 2b + 3c = 5 \\ 3a - b + 2c = 8 \\ 4a - 6b - 4c = -2 \end{cases}$$

Find  $c$ .

**Solution.**

Write the system in the matrix form:

$$\begin{pmatrix} 1 & 2 & 3 \\ 3 & -1 & 2 \\ 4 & -6 & -4 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 5 \\ 8 \\ -2 \end{pmatrix};$$

Lead it to a triangular form. Firstly, subtract the first row, multiplied by 3, from the second row and subtract the first row, multiplied by 4, from the third row:

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -7 & -7 \\ 0 & -14 & -16 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 5 \\ -7 \\ -22 \end{pmatrix};$$

Then divide the second row by -7:

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 0 & -14 & -16 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 5 \\ 1 \\ -22 \end{pmatrix};$$

Now add the second row. Multiplied by 14, to the third row:

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 0 & 0 & -2 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 5 \\ 1 \\ -8 \end{pmatrix};$$

Lastly, divide the third row by -2:

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 5 \\ 1 \\ 4 \end{pmatrix};$$

Hence:

$$c = 4 \Rightarrow b = 1 - c = -3 \Rightarrow a = 5 - 2b - 3c = -1 \Rightarrow \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} -1 \\ -3 \\ 4 \end{pmatrix}.$$

**Answer.**

$c = 4$ .

