

Answer on question 35904 – Math – Linear Algebra

Solve the set of linear equations by the matrix method : $a+3b+2c=3$, $2a-b-3c= -8$, $5a+2b+c=9$. Solve for a

Solution

a, b and c are variables. So we get this system in the matrix form

$$\begin{pmatrix} 1 & 3 & 2 \\ 2 & -1 & -3 \\ 5 & 2 & 1 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 3 \\ -8 \\ 9 \end{pmatrix}.$$

Gaussian elimination method gives us

$$\begin{aligned} \left(\begin{array}{ccc|c} 1 & 3 & 2 & 3 \\ 2 & -1 & -3 & -8 \\ 5 & 2 & 1 & 9 \end{array} \right) &\sim \begin{pmatrix} (1) \\ (2) - 2(1) \\ (3) - 5(1) \end{pmatrix} \sim \left(\begin{array}{ccc|c} 1 & 3 & 2 & 3 \\ 0 & -7 & -7 & -14 \\ 0 & -13 & -9 & -6 \end{array} \right) \sim \begin{pmatrix} (1) \\ (2) \\ -7 \\ -(3) \end{pmatrix} \sim \\ &\sim \left(\begin{array}{ccc|c} 1 & 3 & 2 & 3 \\ 0 & 1 & 1 & 2 \\ 0 & 13 & 9 & 6 \end{array} \right) \sim \begin{pmatrix} (1) \\ (2) \\ (3) - 13(2) \end{pmatrix} \sim \left(\begin{array}{ccc|c} 1 & 3 & 2 & 3 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 4 & 20 \end{array} \right) \sim \begin{pmatrix} (1) + 2(3) \\ (2) - (3)/4 \\ (3) \\ 4 \end{pmatrix} \sim \\ &\sim \left(\begin{array}{ccc|c} 1 & 3 & 0 & -7 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 5 \end{array} \right) \sim \begin{pmatrix} (1) - 3(2) \\ (2) \\ (3) \end{pmatrix} \sim \left(\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & -5 \end{array} \right). \end{aligned}$$

Therefore, $a=2$.

Answer: 2.