Answer Question #40857 – 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 b.

Solution:

$$\begin{cases} a + 3b + 2c = 3 \\ 2a - b - 3c = -8 \\ 5a + 2b + c = 9 \end{cases}$$

By matrix method: $A * x = b \quad => \quad \vec{x} = A^{-1} * \vec{b}$

$$\begin{pmatrix} 1 & 3 & 2 \\ 2 & -1 & -3 \\ 5 & 2 & 1 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 3 \\ -8 \\ 9 \end{pmatrix} \quad => \quad A * \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 3 \\ -8 \\ 9 \end{pmatrix}$$

$$\begin{pmatrix} a \\ b \\ c \end{pmatrix} = A^{-1} * \begin{pmatrix} 3 \\ -8 \\ 9 \end{pmatrix}$$

Let's find A^{-1}:

$$A^{-1} = \frac{1}{28} \begin{pmatrix} -5 & -1 & 7 \\ 17 & 9 & -7 \\ -9 & -13 & 7 \end{pmatrix}$$

From this:

$$\begin{pmatrix} a \\ b \\ c \end{pmatrix} = \frac{1}{28} \begin{pmatrix} -5 & -1 & 7 \\ 17 & 9 & -7 \\ -9 & -13 & 7 \end{pmatrix} * \begin{pmatrix} 3 \\ -8 \\ 9 \end{pmatrix} = \begin{pmatrix} 2 \\ -3 \\ 5 \end{pmatrix}$$

So:

$$a = 2, b = -3, c = 5$$