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Quiz : 01

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QNo.1

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

$$-y + 3z + 4t = 0$$

$$2x + y + 9z + 6t = -3$$

$$3x + 2y + 4z + 8t = -1$$

Sol: using Gauss Junction method

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

$$-y + 3z + 4t = 0$$

$$2x + y + 9z + 6t = -3$$

$$3x + 2y + 4z + 8t = -1$$

using system in matrix form.

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

$$x - y + 3z = 0$$

$$6t + 2x + y + 9z = -3$$

$$8t + 3x + 2y + 4z = -1$$

$$= \left[\begin{array}{cccc|c} 2 & 1 & 3 & 5 & 2 \\ 0 & 1 & -1 & 3 & 0 \\ 6 & & & & -3 \\ 8 & 3 & 2 & 4 & -1 \end{array} \right] \text{ring row 2 by } -1 \text{ and} \\ \text{add to row 1}$$

$$= \left[\begin{array}{cccc|c} 2 & 0 & 4 & 2 & 2 \\ 0 & 1 & -1 & 3 & 0 \\ 6 & 2 & 1 & 9 & -3 \\ 8 & 3 & 2 & 4 & -1 \end{array} \right] \text{Multi row 2 by } -2 \\ \text{and add it to row 3}$$

$$= \left[\begin{array}{cccc|c} 2 & 0 & 4 & 2 & 2 \\ 0 & 1 & -1 & 3 & 0 \\ 6 & 0 & 3 & 3 & -3 \\ 8 & 0 & 5 & -5 & -1 \end{array} \right] \text{multi row 2 by } -3 \text{ and} \\ \text{add it to row 4}$$

$$= \left[\begin{array}{cccc|c} 1 & 0 & 2 & 1 & 1 \\ 0 & 1 & -1 & 3 & 0 \\ 6 & 0 & 3 & 3 & -3 \\ 8 & 0 & 5 & -5 & -1 \end{array} \right] \text{Divide the row by } 2$$

$$= \left[\begin{array}{cccc|c} 1 & 0 & 2 & 1 & 1 \\ 0 & 1 & -1 & 3 & 0 \\ 2 & 0 & 1 & 1 & -1 \\ 8 & 0 & 5 & -5 & -1 \end{array} \right] \text{Divide the row 3 by 2.}$$

$$= \left[\begin{array}{ccc|c} 1 & 0 & 2 & 1 \\ 0 & 1 & -1 & 0 \\ 0 & 2 & -3 & -3 \\ 8 & 2 & -5 & -1 \end{array} \right] \text{ multi row 1 by 2 \& add} \\ \text{it to row 3}$$

$$= \left[\begin{array}{ccc|c} 1 & 0 & 2 & 1 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & -3 & 1 \\ 0 & 0 & -11 & -13 \end{array} \right] \text{ multi row 1 by } -8 \text{ \& } \\ \text{add it to row 4}$$

$$= \left[\begin{array}{ccc|c} 1 & 0 & 2 & 1 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & -3 & 1 \\ 0 & 0 & -11 & -13 \end{array} \right] \text{ multi row 3 by } -1$$

$$= \left[\begin{array}{ccc|c} 1 & 0 & 2 & 1 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & 3 & 1 \\ 0 & 0 & 11 & 13 \end{array} \right] \text{ multi row 4 by } -1$$

$$= \left[\begin{array}{ccc|c} 1 & 0 & 2 & 1 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & 3 & 1 \\ 0 & 0 & 11 & 13 \end{array} \right] \text{ multi row 3 by } -1 \\ \text{add it to row 1.}$$

$$= \left[\begin{array}{cccc|ccc} 1 & 0 & 0 & 0 & -1 & 0 & -2 \\ 0 & 1 & 0 & 0 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 & 1 & 3 \\ 0 & 0 & 11 & 13 & 0 & 0 & 9 \end{array} \right] \text{mult row 3 by } -3 \text{ and} \\ \text{add it to row 2.}$$

$$= \left[\begin{array}{cccc|ccc} 1 & 0 & 0 & 0 & -1 & 0 & -2 \\ 0 & 1 & 0 & 0 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 & 1 & 3 \\ 0 & 0 & -28 & 0 & -30 & 0 & -30 \end{array} \right] \text{Multi row 3 by } -13 \\ \text{and add it to row 4}$$

$$= \left[\begin{array}{cccc|ccc} 1 & 0 & 0 & 0 & -1 & 0 & -2 \\ 0 & 1 & 0 & 0 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 & 1 & 3 \\ 0 & 0 & 0 & 0 & 1 & 0 & 15/14 \end{array} \right] \text{Divide row 4 by } -8.$$

$$= \left[\begin{array}{cccc|ccc} 1 & 0 & 0 & 0 & -13/14 & 0 & -13/14 \\ 0 & 1 & 0 & 0 & -9 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 & 1 & 3 \\ 0 & 0 & 0 & 0 & 1 & 0 & 15/14 \end{array} \right] \text{Add row 4 to row 1}$$

$$= \left[\begin{array}{cccc|ccc} 1 & 0 & 0 & 0 & -13/14 & 0 & -13/14 \\ 0 & 1 & 0 & 0 & 12/14 & 0 & 12/14 \\ 0 & 0 & 3 & 1 & 3 & 1 & 3 \\ 0 & 0 & 0 & 0 & 1 & 0 & 15/14 \end{array} \right] \text{Multi row 4 by } 10 \frac{2}{3} \\ \text{add it to row 2.}$$

$$= \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -13/14 \\ 0 & 1 & 0 & 0 & 12/7 \\ 0 & 0 & 0 & 1 & -3/14 \\ 0 & 0 & 1 & 0 & 15/14 \end{array} \right] \begin{array}{l} \text{Multi row 4 by } -3 \\ \text{\⟨ add it to row 3} \end{array}$$

Convert the augmented matrix into a system of linear equations

$$t = -13/14$$

$$x = 12/7$$

$$z = 13/14$$

$$y = 15/14$$

The possible sol of system is the ordered 4 tuple.

$$(t, x, y, z) = \left(-13/14, 12/7, 15/14, 3/14 \right)$$

check if the given data tuple is sol of system of equation

$$12/7 + 3x \cdot 15/14 + 5x(-3/14) + 2x(-13/14) = 2$$

$$-15/14 + 3x(-3/14) + 12/7 = 0$$

$$2x \cdot 12/7 + 15/14 + 9x(-3/14) + 6x(-13/14) = -3$$

$$3x \cdot 12/7 + 2x \cdot 15/14 + 4x(-3/14) + 8x(-13/14) = -1$$

Simplifying the eq's.

$$2 = 2$$

$$0 = 0$$

$$-3 = -3$$

$$-1 = -1$$

Since all the equations are true so ordered 4 tuple is sol of system.

$$\textcircled{a} (t, x, y, z) = (-13/14, 12/7, 15/14, -3/14) \text{ Ans.}$$
