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SECTION :- "B"

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SUBJECT :- Differential equation.

Assignment :- 01

Submitted To :-

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Questions : 1

$$\begin{aligned}x + 3y + 5z + 2t &= 2 \\ -y + 3z + 4t &= 10\end{aligned}$$

$$\begin{aligned}2x + y + 9z + 6t &= -3 \\ 3x + 2y + 4z + 8t &= -1\end{aligned}$$

Sol:- using Gauss Jordan method.

$$\begin{aligned}x + 3y + 5z - 2t &= 2 \\ -y + 3z + x &= 0\end{aligned}$$

$$\begin{aligned}2x + y + 9z + 6t &= -3 \\ 3x + 2y + 4z + 8t &= -1\end{aligned}$$

Writing system in matrix form.

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

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

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

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

$$\left| \begin{array}{cccc|c} 2 & 1 & 3 & 5 & 2 \\ 0 & 1 & -1 & 3 & 0 \\ 6 & 2 & 1 & 9 & -3 \\ 8 & 3 & 2 & 4 & -1 \end{array} \right|$$

$$\left| \begin{array}{cccc|c} 4 & 0 & 4 & 2 & 9 \\ 0 & 1 & -1 & 3 & 0 \\ 6 & 2 & 1 & 9 & -3 \\ 8 & 3 & 9 & 4 & -1 \end{array} \right| \begin{array}{l} \text{xing row} \\ \text{and add} \end{array} \begin{array}{l} \text{gby+1} \\ \text{to row 1} \end{array}$$

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

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

$$\left| \begin{array}{cccc|c} 1 & 0 & 2 & 1 & 1 \\ 0 & 1 & -1 & 3 & 0 \\ 6 & 0 & 3 & 3 & -3 \\ 8 & 0 & 5 & -5 & 1 \end{array} \right| \begin{array}{l} \text{Divide the rows} \\ \text{by 9} \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & 2 & 1 & 1 \\ 0 & 1 & -1 & 3 & 0 \\ 2 & 0 & 1 & 1 & -1 \\ 8 & 0 & 5 & -5 & -1 \end{array} \right| \begin{array}{l} \text{Divide} \\ \text{the rows by 3} \end{array}$$

(5)

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

$$\left| \begin{array}{cccc|c} 1 & 0 & 2 & 1 & 1 \\ 0 & 1 & -1 & 3 & 0 \\ 0 & 0 & -3 & 1 & -3 \\ 0 & 0 & -11 & -13 & -9 \end{array} \right| \begin{array}{l} \text{multi row 1 by } -8 \\ \text{add it to trail} \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & 2 & 1 & 1 \\ 0 & 1 & -1 & 3 & 0 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & -11 & -13 & 9 \end{array} \right| \begin{array}{l} \text{multi the row 3 by } -1 \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & 2 & 1 & 1 \\ 0 & 1 & -1 & 3 & 0 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 11 & 13 & 9 \end{array} \right| \begin{array}{l} \text{multi the row 4} \\ \text{by } -1 \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & -1 & 0 & -2 \\ 0 & 1 & -1 & 3 & 0 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 11 & 13 & 9 \end{array} \right| \begin{array}{l} \text{multi row 3} \\ \text{by } -1 \\ \text{and add it to} \\ \text{trail} \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & -1 & 0 & -2 \\ 0 & 1 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 4 & 13 & 9 \end{array} \right| \begin{array}{l} \text{multi row 3 by } -3 \\ \text{and add it to} \\ \text{row 2} \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & 1 & 0 & -2 \\ 0 & 1 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 4 & 13 & -33 \end{array} \right| \begin{array}{l} \text{multi row 3 by } -13 \\ \text{and add it to} \\ \text{row 3} \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & -1 & 0 & -2 \\ 0 & 1 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 1 & 0 & 15/14 \end{array} \right| \text{Divide 4 by } +28$$

$$\left| \begin{array}{cccc|c} 1 & 0 & 0 & 0 & 13/14 \\ 0 & 1 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 1 & 0 & 15/14 \end{array} \right| \begin{array}{l} \text{Add row 4} \\ \text{to row 1} \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & 0 & 0 & -13/14 \\ 0 & 1 & 0 & 0 & 12/7 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 1 & 0 & 15/14 \end{array} \right| \begin{array}{l} \text{Multi row 4 by 2} \\ \text{and 2 add it} \\ \text{to row 2} \end{array}$$

$$\left| \begin{array}{cccc|c} 1 & 0 & 0 & 0 & -13/14 \\ 0 & 1 & 0 & 0 & 12/7 \\ 0 & 0 & 0 & 1 & -3/14 \\ 0 & 0 & 1 & 0 & 13/14 \end{array} \right|$$

Multi row 4
by -3 and
add it to row
3

Convert the augmented matrix into a system if has equations

$$t = -13/14$$

$$x = 12/7$$

$$z = +3/14$$

$$y = 15/14$$

The possible solution of system is the ordered 4 tuple

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

Check if the given order 4 tuple is a solution of system of equation.

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

$$-15/14 + 3 \times 15/14 + 5x(-3/14) + 2x(-13/14)$$

$$9x \cdot 12/7 + 15/14 + 4x(-3/14) + 6x(-13/14) = -3$$

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

3

Simplify the equation

$$2 = 2$$

$$6 = 0$$

$$-3 = -3$$

$$-1 = -1$$

Since all the the equalities
are true so ordered 4
type the solution
of system.

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