

Quiz

Submitted By : MUDASIR
Submitted to : Ma'am SHUMEILA.
ID-NO : 7755
Subject : Differential equation
Date : 19 Sep 2020

Q:-

$$\begin{aligned}x + 3y + 5z + 2t &= 2 \\ -y + 3z + 4t &= 0 \\ 2x + y + 9z + 6t &= -3 \\ 3x + 2y + 4z + 8t &= -1\end{aligned}$$

Sol:-

Using Gauss Jordan Method.

Writing system in matrix form

$$\begin{aligned}2t + x + 3y + 5z &= 2 \\ x - y + 3z &= 0 \\ 6t + 2x + y + 9z &= -3 \\ 8t + 3x + 2y + 4z &= -1\end{aligned}$$

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

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

Multiplying row 1 by -1 and add to row 2.

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

Multiply row "2" by -2
and add it to row "3"

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

Multiply row 2 by -3
and add it to row "4"

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

Divide the row "1" by 2

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

Divide the row "3" by 3

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

$$\left[\begin{array}{cccc|c} 1 & 0 & 2 & 1 & 1 \\ 0 & 1 & -1 & 3 & 0 \\ 0 & 0 & -3 & -1 & -3 \\ 0 & 0 & -11 & -13 & -9 \end{array} \right] \begin{array}{l} \text{multiply row 1 by -8} \\ \text{and add it to row "4"} \end{array}$$

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

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

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

$$\left[\begin{array}{cccc|c} 1 & 0 & -1 & 0 & -2 \\ 0 & 1 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 11 & 13 & 9 \end{array} \right]$$

multiply row "3" by -3
and add it to row "2".

$$\left[\begin{array}{cccc|c} 1 & 0 & -1 & 0 & -2 \\ 0 & 1 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & -28 & 0 & -30 \end{array} \right]$$

multiply row 3 by -13
and add it to row
"4"

$$\left[\begin{array}{cccc|c} 1 & 0 & -1 & 0 & -2 \\ 0 & 1 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 1 & 0 & 15/14 \end{array} \right]$$

Divide row "4" by -28

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -13/14 \\ 0 & 1 & -10 & 0 & -9 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 1 & 0 & 15/14 \end{array} \right]$$

Add row "4" to row "1"

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -13/14 \\ 0 & 1 & 0 & 0 & 12/14 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 1 & 0 & 15/14 \end{array} \right]$$

multiply row "4" by 10
if add it to row "2"

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -13/4 \\ 0 & 1 & 0 & 0 & 12/7 \\ 0 & 0 & 0 & 1 & -3/14 \\ 0 & 0 & 1 & 0 & 15/14 \end{array} \right] \text{ multip row 4 by } -3 \text{ and add ito row "3"}$$

Convert the augmented matrix into a system of linear equations.

$$t = -13/4$$

$$m = 12/7$$

$$z = 3/14$$

$$y = 15/14$$

The possible solution of system of is the order 4 type

$$t, m, y, z = \begin{pmatrix} \\ \\ \\ \end{pmatrix}$$

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

$$\left. \begin{aligned} 12/7 + 3 \times (15/14) + 5 \times (-3/14) + 2 \times (13/14) &= 2 \\ -13/14 + 3 \times (-3/14) + 12/7 - &= 0 \\ 2 \times 12/7 + 15/14 + 9 \times (-3/14) + 6 \times (-13/14) &= -3 \\ 3 \times 12/7 + 2 \times 15/14 + 4 \times (-3/14) + 8 \times (13/14) &= -1 \end{aligned} \right\}$$

Simply the equalities

$$2 = 2$$

$$0 = 0$$

$$-3 = -3$$

$$-1 = -1$$

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

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

Ans