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Section B

Semester Summer

Differential Equation

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Date 19th Sep, 2020.

Question No 1.

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

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

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

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

Solution:

First we write into matrix form

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

$$= \left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 0 & -5 & -1 & 2 & -7 \\ 0 & -7 & 11 & 2 & -7 \end{array} \right] \begin{array}{l} \xleftarrow{R_3 - 2R_1} \\ \xleftarrow{R_4 - 3R_1} \end{array}$$

$$= \left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 0 & 0 & -16 & -18 & -7 \\ 0 & 0 & -33 & -26 & -7 \end{array} \right]$$

$$= \left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & 1 & -3 & -4 & 0 \\ 0 & 0 & 1 & 9/8 & 7/16 \\ 0 & 0 & -33 & -26 & -7 \end{array} \right] \begin{array}{l} \xleftarrow{-1 \times R_2} \\ \xleftarrow{-1/16 R_3} \end{array}$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & 1 & -3 & -4 & 0 \\ 0 & 0 & 1 & 9/8 & 7/16 \\ 0 & 0 & 0 & 89/8 & 119/16 \end{array} \right] \quad R_4 + 33R_3$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & 1 & -3 & -4 & 0 \\ 0 & 0 & 1 & 9/8 & 7/16 \\ 0 & 0 & 0 & 89/8 & 119/16 \end{array} \right]$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & 1 & -3 & -4 & 0 \\ 0 & 0 & 1 & 9/8 & 7/16 \\ 0 & 0 & 0 & 1 & 119/216 \end{array} \right] \quad \begin{array}{l} \times 8/89 R_4 \\ \times 8/89 R_4 \end{array}$$

$$= \left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & 1 & -3 & -4 & 0 \\ 0 & 0 & 1 & 8/9 \times 9/8 & 7/16 \times 24/9 \\ 0 & 0 & 0 & 1 & 8/27 \end{array} \right]$$

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

$$= \left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & 1 & -3+3 & -4+4 & 0 \\ 0 & 0 & 1 & 0 & 2/9 \\ 0 & 0 & 0 & 1 & 3 \end{array} \right] \quad \begin{array}{l} R_2 + 3R_3 \\ R_2 + 4R_4 \end{array}$$

$$= \left(\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & 1 & 0 & 0 & 2/3 \\ 0 & 0 & 1 & 0 & 2/9 \\ 0 & 0 & 0 & 1 & 3 \end{array} \right)$$

$$\left(\begin{array}{cccc|c} 1 & \cancel{3-3} & \cancel{5-5} & \cancel{2-2} & -8 \\ 0 & 1 & 0 & 0 & 2/3 \\ 0 & 0 & 1 & 0 & 2/9 \\ 0 & 0 & 0 & 1 & 3 \end{array} \right)$$

$$\left(\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -8 \\ 0 & 1 & 0 & 0 & 2/3 \\ 0 & 0 & 1 & 0 & 2/9 \\ 0 & 0 & 0 & 1 & 3 \end{array} \right)$$

So simply the Equation as

$$(x, y, z, t)$$

=

$$(-8, 2/3, 2/9, 3)$$

Answer