

Quiz.

Subject : Differential equation

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Solve the following systems of equation.

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

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

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

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

Solution:

write the Equation in Augmented matrix form.

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 2 & 1 & 9 & 6 & -3 \\ 3 & 2 & 4 & 8 & -1 \end{array} \right] R_3 - 2R_1$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 2-2 & 1-6 & 9-10 & 6-4 & -3-4 \\ 3 & 2 & 4 & 8 & -1 \end{array} \right]$$

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$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 0 & -5 & -1 & 2 & -7 \\ 3 & 2 & 4 & 8 & 1 \end{array} \right] \quad R_4 - 3R_1$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 0 & -5 & -1 & 2 & -7 \\ 3-3 & 2-9 & 4-15 & 8-6 & 1-6 \end{array} \right]$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 0 & -5 & -1 & 2 & -7 \\ 0 & -7 & -11 & 2 & -5 \end{array} \right] \quad R_3 - 5R_2$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 0+0 & -5+5 & -1-15 & 2-20 & -7-0 \\ 0 & -7 & -11 & 2 & -5 \end{array} \right]$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 0+0 & -5+5 & -1-15 & 2-20 & -7-0 \\ 0 & -7 & -11 & 2 & -5 \end{array} \right]$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 5 & 2 & 2 \\ 0 & -1 & 3 & 4 & 0 \\ 0 & 0 & -16 & -18 & -7 \\ 0 & -7 & -11 & 2 & -5 \end{array} \right] \quad R_4 - 7R_2$$

$$= \begin{bmatrix} 1 & 3 & 5 & 2 & : & 2 \\ 0 & -1 & 3 & 4 & : & 0 \\ 0 & 0 & -16 & -18 & : & -7 \\ 0-0 & -7+7 & -11+21 & 2-28 & : & -5-0 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 3 & 5 & 2 & : & 2 \\ 0 & -1 & 3 & 4 & : & 0 \\ 0 & 0 & -16 & -18 & : & -7 \\ 0 & 0 & -32 & -26 & : & -5 \end{bmatrix} R_4 - 2R_3$$

$$= \begin{bmatrix} 1 & 3 & 5 & 2 & : & 2 \\ 6 & -1 & 3 & 4 & : & 0 \\ 0 & 0 & 16 & -18 & : & -7 \\ 0-0 & 0-0 & -32+32 & -2+36 & : & -5+14 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 3 & 5 & 2 & : & 2 \\ 0 & -1 & 3 & 4 & : & 0 \\ 0 & 0 & -16 & -18 & : & -7 \\ 0 & 0 & 0 & 10 & : & 9 \end{bmatrix}$$

$$\Rightarrow 10t = 9 \Rightarrow t = 9/10$$

$$= -16z - 18t = -7$$

$$= -16z - 18(9/10) = -7$$

$$= -16z - 20 = -7$$

$$= -16z = +20 - 7 \Rightarrow z = -13/16$$

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

$$\Rightarrow -y + 3\left(\frac{-13}{16}\right) + 4\left(\frac{10}{9}\right) = 0$$

$$\Rightarrow -y - \frac{39}{16} + \frac{40}{9} = 0$$

$$\Rightarrow -y = \frac{(40)}{9} - \frac{(39)}{16}$$

$$= \frac{16 \times 40 - 39 \times 9}{9 \times 16} =$$

$$= \frac{640 - \del{351} 351}{144}$$

$$y = \frac{\del{289} 289}{144}$$

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

$$= x + 3 \left(\frac{289}{144} \right) + 5 \left(-\frac{13}{16} \right) + 2 \left(\frac{10}{9} \right) = 2$$

$$= x + \frac{867}{144} - \frac{65}{16} + \frac{20}{9} = 2$$

$$= x + \frac{869 - 9 \times 65 + 20 \times 16}{144} = 2$$

$$= x + \frac{869 - 585 + 320}{144} = 2$$

$$= x + \frac{604}{144} = 2$$

$$= x = 2 - \frac{604}{144}$$

$$x = \frac{144 \times 2 - 604}{144}$$

$$\boxed{x = \frac{316}{144}} \text{ OR } \boxed{x = -2.19} \text{ Ans =}$$