

## Quiz #1

NAME

Munex Khan

ID No

7752

Section

B

Subject

Differential Equations

Submitted to

Maam Shumaila

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\* Solve The following System of equation.

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

Solve:  $\Rightarrow$

Using Gaussian elimination  
to find Solution of the above  
System of equation

Augmented Matrix:

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

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

$$\begin{array}{l}
 R_3 - 5R_2 \\
 R_4 - 7R_2
 \end{array}
 \left[ \begin{array}{cccc|c}
 1 & 3 & 5 & 2 & 2 \\
 0 & -1 & 3 & 4 & 0 \\
 0 & 0 & -16 & -18 & -7 \\
 0 & 0 & -32 & -26 & -7
 \end{array} \right]$$

$$\left[ \begin{array}{cccc|c}
 1 & 3 & 5 & 2 & 2 \\
 0 & -1 & 3 & 4 & 0 \\
 0 & 0 & -16 & -18 & -7 \\
 0 & 0 & -32 & -26 & -7
 \end{array} \right]$$

$$R_4 - 2R_3
 \left[ \begin{array}{cccc|c}
 1 & 3 & 5 & 2 & 2 \\
 0 & -1 & 3 & 4 & 0 \\
 0 & 0 & -16 & -18 & -7 \\
 0 & 0 & 0 & 10 & 7
 \end{array} \right]$$

$$\begin{array}{l}
 R_1 - 2 \\
 -R_2 \\
 \frac{1}{16}R_3 \\
 \frac{1}{10}R_4
 \end{array}
 \left[ \begin{array}{cccc|c}
 -1 & 1 & 3 & 0 & 0 \\
 0 & 1 & -3 & -4 & 0 \\
 0 & 0 & 1 & 9/8 & 7/16 \\
 0 & 0 & 0 & 1 & 7/10
 \end{array} \right]$$

Now we have the equation

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

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

$$z + \frac{9}{8}t = \frac{7}{16} \quad \boxed{t = \frac{7}{10}}$$

Now eq<sup>iii</sup>

$$z + \frac{9}{8} \left( \frac{7}{10} \right) = \frac{7}{16}$$

$$z + \frac{63}{80} = \frac{7}{16}$$

$$z = \frac{7}{16} - \frac{63}{80}$$
$$= -\frac{28}{80}$$

$$z = -\frac{7}{20}$$

Now eq<sup>ii</sup>

$$y - 3 \left( -\frac{7}{20} \right) - 4 \left( \frac{7}{10} \right) = 0$$

$$y + \frac{21}{20} - \frac{14}{5} = 0$$

$$y = \frac{14}{5} - \frac{21}{20} = \frac{56 - 21}{20} = \frac{35}{20}$$

$$y = \frac{7}{4}$$

Now eq<sup>i</sup>

$$-x + \frac{7}{4} + 3 \left( -\frac{7}{20} \right) = 0$$

$$x = -\frac{21}{20} + \frac{7}{4} = \frac{-21 + 35}{20} = \frac{14}{20} = \frac{7}{10}$$

check.

we have equations:

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

By Putting value:

$$\left(-\frac{7}{4}\right) + 3\left(-\frac{7}{20}\right) + 4\left(\frac{7}{10}\right) = 0$$

$$-\frac{7}{4} - \frac{21}{20} + \frac{28}{10} = 0$$

taking L.C.M

$$\frac{-35 - 21 + 56}{20} = 0$$

$$\frac{-56 + 56}{20} = 0$$

$$\frac{0}{20} = 0$$

$0 = 0$  okay.