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QNo 1:- Determine if the following System is consistent or not:

ID = 16284

$x_1 - (3^{rd} - ID)\, x_2 + x_3 = 0$ $\qquad ID_3 = 2$

$2x_2 - 8x_3 = 8$

$5x_1 - 5x_3 = 10$

$x_1 - 2x_2 + x_3 = 0$

$0x_1 + 2x_2 - 8x_3 = 8$

$5x_1 + 0x_2 - 5x_3 = 10$

Now write in matrix form.

$$\left[\begin{array}{ccc:c} 1 & -2 & 1 & 0 \\ 0 & 2 & -8 & 8 \\ 5 & 0 & -5 & 10 \end{array}\right]$$

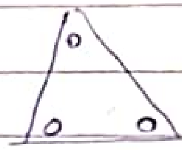
we dividing Row 2 by 2.

$$\left[\begin{array}{ccc:c} 1 & -2 & 1 & 0 \\ 0 & 1 & -4 & 4 \\ 5 & 0 & -5 & 10 \end{array}\right] \begin{array}{l} \frac{1}{2}R_2 \\ \frac{1}{5}R_3 \end{array}$$

$$\begin{bmatrix} 1 & -2 & 1 & 0 \\ 0 & 1 & -4 & 4 \\ 1 & 0 & -1 & 5 \end{bmatrix}$$

consistente At least one Solution

$$\begin{bmatrix} 1 & -2 & 1 & 0 \\ 0 & 1 & -4 & 4 \\ 1 & 0 & -1 & 5 \end{bmatrix}$$

Lowe triangle like 
are not zero

So The following System is
not consistent.

b/c $x_1 = 1$, $x_2 = 1$ $x_3 = -1$

Q No 2:- Find the inverse of

$$A = \begin{bmatrix} 3 & 4 & 5 \\ 2 & -1 & \text{with ID} \\ 5 & -2 & 7 \end{bmatrix}$$ by adjoint method.

$\because$ ID = 16284

Solution:

$$\begin{bmatrix} 3 & 4 & 5 \\ 2 & -1 & 8 \\ 5 & -2 & 7 \end{bmatrix}$$

$$A^{-1} = \frac{\text{adj}(A)}{|A|}$$

$$|A| = \begin{vmatrix} 3 & 4 & 5 \\ 2 & -1 & 8 \\ 5 & -2 & 7 \end{vmatrix}$$

$$= 3\{(-1\times 7)-(-2\times 8)\} - 4\{(2\times 7)-(5\times 8)\} + 5\{(2\times -2)-(5\times -1)\}$$

$$= 3(-7+16) - 4(14-40) + 5(-4+5)$$

$$= 3(9) - 4(-26) + 5(1)$$

$$= 27 + 104 + 5$$

$$\boxed{|A| = 136}$$

$$A_{11} = (-1)^{1+1} \times \begin{vmatrix} -1 & 8 \\ -2 & 7 \end{vmatrix}$$

$$= 1 \times (-7+16) = 9$$

$$\boxed{A_{11} = 9}$$

$$A_{12} = (-1)^{1+1} \times \begin{vmatrix} 2 & 8 \\ 5 & 7 \end{vmatrix}$$

$$= -1 \times (14 - 40) = 26$$

$$\boxed{A_{12} = 26}$$

$$A_{13} = (-1)^{1+3} \times \begin{vmatrix} 2 & -1 \\ 5 & -2 \end{vmatrix}$$

$$= 1 \times (-4+5) = 1$$

$$\boxed{A_{13} = 1}$$

$$A_{21} = (-1)^{1+1} \times \begin{vmatrix} 4 & 5 \\ -2 & 7 \end{vmatrix}$$

$$= -1 \times (28 + 10)$$

$$\boxed{A_{21} = -38}$$

$$A_{22} = (-1)^{2+2} \times \begin{vmatrix} 3 & 5 \\ 5 & 7 \end{vmatrix}$$

$$= 1 \times (21 - 25) = -4$$

$$\boxed{A_{22} = -4}$$

$$A_{23} = (-1)^{2+3} \times \begin{vmatrix} 3 & 4 \\ 5 & 2 \end{vmatrix}$$

$$= -1 \times (-6 - 20) = 26$$

$$\boxed{A_{23} = 26}$$

$$A_{31} = (-1)^{3+1} \times \begin{vmatrix} 4 & 5 \\ -1 & 8 \end{vmatrix}$$

$$= 1 \times (32 + 5) = 37$$

$$\boxed{A_{31} = 37}$$

$$A_{32} = (-1)^{3+2} \times \begin{vmatrix} 3 & 5 \\ 2 & 8 \end{vmatrix}$$

$$= -1 \times (24 - 10) = -14$$

$$\boxed{A_{32} = -14}$$

$$A_{33} = (-1)^{3+3} \times \begin{vmatrix} 3 & 4 \\ 2 & -1 \end{vmatrix}$$

$$= 1 \times (-3-8) = -11$$

$$\boxed{A_{33} = -11}$$

$$\text{adj}(A) = \begin{bmatrix} 9 & 26 & 1 \\ -38 & -4 & 26 \\ 37 & -14 & -11 \end{bmatrix}$$

$$\text{adj } A = \begin{bmatrix} 9 & -38 & 37 \\ 26 & -4 & -14 \\ 1 & 26 & -11 \end{bmatrix}$$

$$A^{-1} = \frac{\text{adj } A}{|A|}$$

$$= \frac{1}{136} \begin{bmatrix} 9 & -38 & 37 \\ 26 & -4 & -14 \\ 1 & 26 & -11 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 9/136 & -38/136 & 37/136 \\ 26/136 & -4/136 & -14/136 \\ 1/136 & 26/136 & -11/136 \end{bmatrix}$$ Ans.

Q No 6:- Reduce the matrix to normal form and find its rank

$$\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 0 \end{bmatrix}$$

Solution:-

$$\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 0 \end{bmatrix}$$

$$\begin{array}{l} R_2 - 3R_1 \\ \\ R_3 - R_1 \end{array} \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 0 \end{bmatrix}$$

$$-2R_3 - R_2 \begin{bmatrix} 1 & 3 & 4 & 3 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & -3 \end{bmatrix}$$

$$\begin{array}{l} C_2 - 3C_1 \\ C_3 - 4C_1 \\ C_4 - 3C_1 \end{array} \begin{bmatrix} 1 & 3 & 4 & 3 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Swap C_4 with C_2 we get

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -6 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Divide C_2 by -6, we have

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{Rank} = 2}$ Answer

QNo 3:- Solve the following system of linear equations by Guass - jordon method.

Solution:-

$$\begin{bmatrix} 2 & 2 & 4 & 18 \\ 1 & 3 & 2 & 13 \\ 3 & 2 & -3 & 14 \end{bmatrix}$$

$$R_1 = \frac{1}{2}R_1 \quad \begin{bmatrix} 1 & 1 & 2 & 9 \\ 1 & 3 & 2 & 13 \\ 3 & 2 & -3 & 14 \end{bmatrix}$$

$$\begin{matrix} R_2 = R_2 - R_1 \\ R_3 = R_3 - 3R_1 \end{matrix} \quad \begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 2 & 0 & 4 \\ 0 & -2 & -6 & 13 \end{bmatrix}$$

$$R_2 = \frac{1}{2}R_2 \quad \begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & -2 & -6 & -13 \end{bmatrix}$$

$$R_3 = R_3 + 2R_1 \quad \begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 2 & 0 & 2 \\ 0 & 0 & -6 & -9 \end{bmatrix}$$

$R_1 = R_1 - R_2$
$R_3 = \frac{-1}{6} R_3$
$$\begin{bmatrix} 1 & 0 & 2 & 7 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -3/2 \end{bmatrix}$$

$R_1 = R_1 - 2R_3$
$$\begin{bmatrix} 1 & 0 & 0 & 10 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -3/2 \end{bmatrix}$$

$$x + 0y + 0z = 10$$
$$0x + y + 0z = 2$$
$$0x + 0y + z = -3/2$$

$x = 10$

$y = 2$

$z = -3/2$

Ans.

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Q No 5:- Determine the following homgenous has a non-terival solution. then describe the slotuion set.

$$3x_1 + 5x_2 - 4x_3 = 0$$
$$-3x_1 - 25x_2 - 4x_3 = 0$$
$$6x_1 + x_2 - 8x_3 = 0$$

$$A = \begin{bmatrix} 3 & 5 & -4 \\ -3 & -25 & 4 \\ 6 & 1 & 8 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$A = \left[\begin{array}{ccc|c} 3 & 5 & -4 & 0 \\ -3 & -25 & 4 & 0 \\ 6 & 1 & 8 & 0 \end{array}\right]$$

$$A = \left[\begin{array}{ccc|c} 3 & 5 & -4 & 0 \\ 0 & 20 & 0 & 0 \\ 6 & 1 & 8 & 0 \end{array}\right] \quad R_2 + R_1$$

$$A = \left[\begin{array}{ccc|c} 1 & 5/3 & -4/3 & 0 \\ 0 & 20 & 0 & 0 \\ 6 & 1 & 8 & 0 \end{array}\right] \quad R_1/3$$

$$A = \left[\begin{array}{ccc|c} 1 & 5/3 & -4/3 & 0 \\ 0 & 20 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right] \quad R_3 - 6R_1$$

$\Rightarrow$ From R_2 :-

$$20x_1 = 0$$
$$x_2 = 0$$

⇒ From R_1 :-

$$x + \frac{5}{3}x_2 - \frac{4}{3}x_3 = 0$$
$$x = t$$
$$S.S = \{t, -t, t\}$$

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Q No 4:-

Show that this matrix is Diagonisable.

$$\begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$$

Let $(A - 2I) = 0$

$$\begin{bmatrix} 4-\lambda & 2 & -2 \\ -5 & 3-\lambda & 2 \\ -2 & 4 & 1-\lambda \end{bmatrix} = 2.$$

$$4-\lambda \begin{vmatrix} 3-\lambda & 2 \\ 4 & 1-\lambda \end{vmatrix} - 2 \begin{vmatrix} -5 & 2 \\ -2 & 1-\lambda \end{vmatrix} + (-2) \begin{vmatrix} -5 & 3-\lambda \\ -2 & 4 \end{vmatrix}$$

$$4-\lambda [(3-2)(1-\lambda) - (8)] - 2[(1-\lambda(1-\lambda)+4] - 2(-20+6-22)$$

$$4-\lambda(3-32-\lambda+22-8) - 2(-5+5\lambda+4) - 2(-20+6-22)$$
$$(\lambda^3 + 8\lambda^2 - 112 - 20) + (10 - 10\lambda + 8) - 40 - 12 + 44$$

$$\lambda^3 + 8\lambda^2 - 112 - 20 + 10 - 10\lambda - 8 + 40 - 12 + 4\lambda$$
$$\boxed{\lambda^3 + 8\lambda^2 - 172 + 10}$$ Ans

THE END