ABASYN University

Name: Muhammad Azlan Shah

Roll No: 26112

Section: CD

Course: Linear Algebra

Teaher: Sir Hamid Qadri

Assignment 01

Chapter No # 01

Exercise No 1.1

Question 1 TO 4 and 11 TO 18

NAME : M. Azlan Shah
RollNo. : 26112
Course : Linear Algebra
Teacher : Sir. Hamid Qadri

EXERCISE: 1.2 (1-4)

1. $x_1 + 5x_2 = 7$
$-2x_1 - 7x_2 = -5$

Sol:- The above equation can be Uniformed as $Ax=b$

$A=\begin{bmatrix} 1 & 5 \\ -2 & -7 \end{bmatrix}$, $x=\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$, $\begin{bmatrix} 7 \\ -5 \end{bmatrix}$

Construct augmented matrix of [A|B] to find solution.

$[A/b] = \left[\begin{array}{cc|c} 1 & 5 & 7 \\ -2 & -7 & -5 \end{array}\right]$

$\sim_R \left[\begin{array}{cc|c} 1 & 5 & 7 \\ 0 & 3 & 9 \end{array}\right] R_2+2R_1$

$\boxed{\begin{array}{ccc} \because -2 & -7 & -5 \\ 2 & 10 & 14 \\ \hline 0 & 3 & 9 \end{array}}$

$\sim_R \left[\begin{array}{cc|c} 1 & 5 & 7 \\ 0 & 1 & 3 \end{array}\right] 1/3 R_2$

$\sim_R \left[\begin{array}{cc|c} 1 & 0 & -8 \\ 0 & 1 & 3 \end{array}\right] R_1-5R_2$

$\boxed{\begin{array}{ccc} 1 & 5 & 7 \\ 0 & -5 & -15 \\ \hline 1 & 0 & -8 \end{array}}$

Solution Set is $(x_1, x_2) = (-8, 3)$

System has exactly one solution.

2. $3x_1 + 6x_2 = -3$

$5x_1 + 7x_2 = 10$

Solution:-

$$A = \begin{bmatrix} 3 & 6 \\ 5 & 7 \end{bmatrix},\ b = \begin{bmatrix} -3 \\ 10 \end{bmatrix},\ x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Two find the Solution, the Value of (x_1, x_2), we use row operation on augmented matrix. $[A/b]$

$$[A|b] = \left[\begin{array}{cc|c} 3 & 6 & -3 \\ 5 & 7 & 10 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{cc|c} 3 & 6 & -3 \\ 15 & 21 & 30 \end{array}\right] 3R_2$$

$$\underset{\sim}{R} \left[\begin{array}{cc|c} 15 & 30 & -15 \\ 15 & 21 & 30 \end{array}\right] 5R_1$$

$$= R \left[\begin{array}{cc|c} 15 & 30 & -15 \\ 0 & -9 & 45 \end{array}\right] R_2 - R_1$$

$$\begin{array}{ccc} 15 & 21 & 30 \\ -15 & -30 & +15 \\ \hline 0 & -9 & 45 \end{array}$$

$$= R \left[\begin{array}{cc|c} 15 & 30 & -15 \\ 0 & 1 & -5 \end{array}\right] -1/9 R_2$$

Solution Set

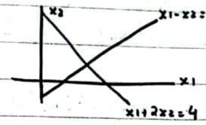
$\boxed{S.S = (x_1, x_2) = (9, -5)}$

$$= R \left[\begin{array}{cc|c} 1 & 2 & -1 \\ 0 & 1 & -5 \end{array}\right] 1/15 R_1$$

$$= R \left[\begin{array}{cc|c} 1 & 0 & 9 \\ 0 & 1 & -5 \end{array}\right]$$

$$\begin{array}{ccc} 1 & 2 & -1 \\ -0 & -2 & +10 \\ \hline 1 & 0 & 9 \end{array}$$

3) Find the point (x_1, x_2) that lies on the line $x_1 + 2x_2 = 4$ and on the line $x_1 - x_2 = 1$.



Solution:- The Above equation can be written as $Ax = B$

$$A = \begin{bmatrix} 1 & 2 \\ 1 & -1 \end{bmatrix},\ x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix},\ b = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$$

$$[A/b] = \left[\begin{array}{cc|c} 1 & 2 & 4 \\ 1 & -1 & 1 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{cc|c} 1 & 2 & 4 \\ 0 & -3 & -3 \end{array}\right] R_2 - R_1$$

$$\begin{array}{ccc} 1 & -1 & 1 \\ -1 & -2 & -4 \\ \hline 0 & -3 & -3 \end{array}$$

$$\underset{\sim}{R} \left[\begin{array}{cc|c} 1 & 2 & 4 \\ 0 & 1 & 1 \end{array}\right] -1/3 R_2$$

$$\underset{\sim}{R} \left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & 1 \end{array}\right] R_1 - 2R_2$$

$$\begin{array}{cccc} R_1 & 1 & 2 & 4 \\ 2R_2 & -0 & -2 & -2 \\ \hline & 1 & 0 & 2 \end{array}$$

Solution. Set $= (x_1, x_2) = (2, 1)$ Ans

4 Find the point of intersection of the lines

$x_1 + 2x_2 = -13$ and $3x_1 - 2x_2 = 1$

Solution:- The Above eq in $Ax = b$

$$A = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix}, \quad x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}, \quad b = \begin{bmatrix} -13 \\ 1 \end{bmatrix}$$

Using row operation $[A/b]$

$$[A/b] = \left[\begin{array}{cc|c} 1 & 2 & -13 \\ 3 & -2 & 1 \end{array}\right]$$

$$\underset{\sim}{R} = \left[\begin{array}{cc|c} 1 & 2 & -13 \\ 0 & -8 & 40 \end{array}\right] R_2 - 3R_1 \qquad \boxed{\begin{array}{ccc} 3 & -2 & 1 \\ -3 & -6 & +39 \\ \hline 0 & -8 & 40 \end{array}}$$

$$\underset{\sim}{R} \left[\begin{array}{cc|c} 1 & 2 & -13 \\ 0 & 1 & -5 \end{array}\right] -1/8\, R_2$$

$$\underset{\sim}{R} \left[\begin{array}{cc|c} 1 & 0 & -3 \\ 0 & 1 & -5 \end{array}\right] R_1 - 2R_2 \qquad \boxed{\begin{array}{ccc} 1 & 2 & -13 \\ -0 & -2 & \mp 10 \\ \hline 1 & 0 & -3 \end{array}}$$

Point of intersection:

$(x_1\ x_2) = (-3, -5)$

26112

05

DATE: DAY:

11) $x_2 + 5x_3 = -4$

$x_1 + 4x_2 + 3x_3 = -2$

$2x_1 + 7x_2 + x_3 = -2$

Sol:-

$$A = \left[\begin{array}{ccc|c} 0 & 1 & 5 & -4 \\ 1 & 4 & 3 & -2 \\ 2 & 7 & 1 & -2 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 4 & 3 & -2 \\ 0 & 1 & 5 & -4 \\ 2 & 7 & 1 & -2 \end{array}\right] R_1 \longleftrightarrow R_2$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 4 & 3 & -2 \\ 0 & 1 & 5 & -4 \\ 0 & 1 & 5 & 2 \end{array}\right] R_3 - 2R_1$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 4 & 3 & -2 \\ 0 & 1 & 5 & -4 \\ 0 & 0 & 0 & 2 \end{array}\right] R_3 + R_2$$

There is no Solution

last row = 0

12. $x_1 - 5x_2 + 4x_3 = -3$

$2x_1 - 7x_2 + 3x_3 = -2$

$-2x_1 + x_2 + 7x_3 = -1$

Solution:- The above eq can be

$$A = \begin{bmatrix} 1 & -5 & 4 \\ 2 & -7 & 3 \\ -2 & 1 & 7 \end{bmatrix} \quad x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}, \; b = \begin{bmatrix} -3 \\ -2 \\ -1 \end{bmatrix}$$

$$[A|b] = \left[\begin{array}{ccc|c} 1 & -5 & 4 & -3 \\ 2 & -7 & 3 & -2 \\ -2 & 1 & 7 & -1 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & -5 & 4 & -3 \\ 0 & 3 & -5 & -4 \\ -2 & 1 & 7 & -1 \end{array}\right] R_2 - 2R_1$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & -5 & 4 & -3 \\ 0 & 3 & -5 & 4 \\ 0 & -9 & 15 & -7 \end{array}\right] R_3 + 2R_1$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & -5 & 4 & -3 \\ 0 & 1 & -5/3 & 4/3 \\ 0 & -9 & 15 & -7 \end{array}\right] 1/3 R_2$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & -5 & 4 & -3 \\ 0 & 1 & -5/3 & 4/3 \\ 0 & 0 & 0 & 5 \end{array}\right] R_3 + 9R_2$$

$(x_1, x_2, 0x_3) : (-3, 4/3, 5)$

$0x_3 = 5$, x_3 is any arbitory num

No Solution.

---

13 Solve the System of linear equation.

$x_1 - 3x_3 = 7$

$2x_1 + 2x_2 + 9x_3 = 7$

$x_2 + 5x_3 = -2$

Solution:- Construct the augmented matrix of the above System.

$$[A|b] = \left[\begin{array}{ccc|c} 1 & 0 & -3 & 8 \\ 2 & 2 & 9 & 7 \\ 0 & 1 & 5 & -2 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 0 & -3 & 8 \\ 0 & 2 & 15 & -9 \\ 0 & 1 & 5 & -2 \end{array}\right] R_2 - 2R_1$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 0 & -3 & 8 \\ 0 & 1 & 15/2 & -9/2 \\ 0 & 1 & 5 & -2 \end{array}\right] \tfrac{1}{2} R_2$$

(26112)

(C8)

$$\sim \left[\begin{array}{ccc|c} 1 & 0 & -3 & 8 \\ 0 & 1 & 15/2 & -9/2 \\ 0 & 0 & -5/2 & -5/2 \end{array}\right] R_3 - R_2$$

$$\sim \left[\begin{array}{ccc|c} 1 & 0 & -3 & 8 \\ 0 & 1 & 15/2 & -9/2 \\ 0 & 0 & 1 & -1 \end{array}\right] -2/5 R_3$$

$$\sim \left[\begin{array}{ccc|c} 1 & 0 & -3 & 8 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 1 \end{array}\right] R_2 - \frac{15}{2} R_3$$

$$\sim \left[\begin{array}{ccc|c} 1 & 0 & 0 & 5 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 1 \end{array}\right] R_1 + 3R_1$$

The given system has exactly one solution i.e (x_1, x_2, x_3) $= (5, 3, 1)$ Ans

Q14) $2x_1 - 6x_3 = -8$

$x_2 + 2x_3 = 3$

$3x_1 + 6x_2 - 2x_3 = -4$

Sol:-

$$A = \left[\begin{array}{ccc|c} 2 & 0 & -6 & -8 \\ 0 & 1 & 2 & 3 \\ 3 & 6 & -2 & 4 \end{array}\right], \quad x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}, \quad b = \begin{bmatrix} -8 \\ 3 \\ -4 \end{bmatrix}$$

$$[A/b] = \left[\begin{array}{ccc|c} 2 & 0 & -6 & -8 \\ 0 & 1 & 2 & 3 \\ 3 & 6 & -2 & 4 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 3 & 6 & -2 & -4 \end{array}\right] 1/2 R_1$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 0 & 6 & 7 & 8 \end{array}\right] R_3 - 3R_1$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 5 & -10 \end{array}\right] R_3 - 6R_2$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 1 & 2 \end{array}\right] -1/5 R_3$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 0 & -3 & 4 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{array}\right] R_2 - 2R_3$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{array}\right] R_1 + 3R_3$$

The System has exactly one Solution.

$(x_1, x_2, x_3) = (2, -1, 2)$ ans

Q15 (26112)

Q15) $x_1 - 6x_2 = 5$
$x_2 - 4x_3 + x_4 = 0$
$-x_1 + 6x_2 + x_3 + 5x_4 = 3$
$-x_2 + 5x_3 + 4x_4 = 0$

Sol:-
The above equation can be written as:

$$A = \begin{bmatrix} 1 & -6 & 0 & 0 \\ 0 & 1 & -4 & 1 \\ -1 & 6 & 1 & 5 \\ 0 & 1 & 5 & 4 \end{bmatrix}, \quad x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}, \quad B = \begin{bmatrix} 5 \\ 0 \\ 3 \\ 0 \end{bmatrix}$$

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

Q15) (26112)

$$\underset{\sim}{R} \left[\begin{array}{cccc|c} 1 & -6 & 0 & 0 & 5 \\ 0 & 1 & -4 & 1 & 0 \\ 0 & 0 & 1 & 5 & 8 \\ 0 & -1 & 5 & 4 & 0 \end{array}\right] R_3 + R_1$$

$$\underset{\sim}{R} \left[\begin{array}{cccc|c} 1 & -6 & 0 & 0 & 5 \\ 0 & 1 & -4 & 1 & 0 \\ 0 & 0 & 1 & 5 & 8 \\ 0 & 0 & 1 & 5 & 0 \end{array}\right] R_4 + R_2$$

$$\underset{\sim}{R} \left[\begin{array}{cccc|c} 1 & -6 & 0 & 0 & 5 \\ 0 & 1 & -4 & 1 & 0 \\ 0 & 0 & 1 & 5 & 8 \\ 0 & 0 & 0 & 0 & -8 \end{array}\right] \begin{array}{l} R_4 - R_3 \\ (R_4 - R_3) \end{array}$$

No Solution.

Q16) $2x_1 - 4x_4 = -10$

$3x_2 + 3x_3 = 0$

$x_3 + 4x_4 = -1$

$-3x_1 + 2x_2 + 3x_3 + x_4 = 5$

Sol:-

$$A = \begin{bmatrix} 2 & 0 & 0 & -4 \\ 0 & 3 & 3 & 0 \\ 0 & 0 & 1 & 4 \\ -3 & 2 & 3 & 1 \end{bmatrix}, \quad x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}, \quad b = \begin{bmatrix} 10 \\ 0 \\ -1 \\ 5 \end{bmatrix}$$

$$[A|b] = \left[\begin{array}{cccc|c} 2 & 0 & 0 & -4 & -10 \\ 0 & 3 & 3 & 0 & 0 \\ 0 & 0 & 1 & 4 & -1 \\ -3 & 2 & 3 & 1 & 5 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{cccc|c} 1 & 0 & 0 & -2 & -5 \\ 0 & 3 & 3 & 0 & 0 \\ 0 & 0 & 1 & 4 & -1 \\ -3 & 2 & 3 & 1 & 5 \end{array}\right] \quad 1/2\, R_1$$

$$\underset{\sim}{R} \left[\begin{array}{cccc|c} 1 & 0 & 0 & -2 & -5 \\ 0 & 3 & 3 & 0 & 0 \\ 0 & 0 & 1 & 4 & -1 \\ 0 & 2 & 3 & -5 & -10 \end{array}\right] \quad R_4 + 3R_1$$

$$\underset{\sim}{R} \left[\begin{array}{cccc|c} 1 & 0 & 0 & -2 & -5 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 4 & -1 \\ 0 & 2 & 3 & -5 & -10 \end{array}\right] \quad 1/3\, R_2$$

$$\underset{\sim}{R} \left[\begin{array}{cccc|c} 1 & 0 & 0 & -2 & -5 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 4 & -1 \\ 0 & 0 & 1 & -5 & -10 \end{array}\right] \quad R_4 - 2R_2$$

$$\underset{\sim}{R} \left[\begin{array}{cccc|c} 1 & 0 & 0 & -2 & -5 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 4 & -1 \\ 0 & 0 & 0 & 1 & -9 \end{array}\right] \quad R_4 - R_3$$

(26112)

$$\sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & -2 & -5 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 4 & -1 \\ 0 & 0 & 0 & 1 & 1 \end{array}\right] -1/9 R_4$$

This System is Constant

17) Do the three line $2x_1 + 3x_2 = -1$, $6x_1 + 5x_2 = 0$, and $2x_1 - 5x_2 = 7$ have a common point of intersection? Explain.

Sol:-

The augmented matrix for the System is:

$$[A|b] = \left[\begin{array}{cc|c} 2 & 3 & -1 \\ 6 & 5 & 0 \\ 2 & -5 & 7 \end{array}\right]$$

(Q17) (26112)

$$\sim \left[\begin{array}{cc|c} 1 & 3/2 & -1/2 \\ 6 & 5 & 0 \\ 2 & -5 & 7 \end{array}\right] 1/2 R_1$$

$$\sim \left[\begin{array}{cc|c} 1 & 3/2 & -1/2 \\ 0 & -4 & 3 \\ 2 & 5 & 7 \end{array}\right] R_2 - 6R_1$$

$$\sim \left[\begin{array}{cc} 1 & 3/2 \\ 0 & -4 \\ 0 & 8 \end{array}\right] R_3 - 2R_1$$

$$\sim \left[\begin{array}{cc|c} 1 & 3/2 & -1/2 \\ 0 & 1 & -3/4 \\ 0 & 0 & 2 \end{array}\right] R_3 + 8R_2$$

There is no Solution, Therefore the three do not have a common point of intersection.

(Q18) (26112)

18) Do the three ~~lines~~ planes $2x_1+4x_2+4x_3=4$, $x_2-2x_3=4$, $2x_1+3x_2=0$, have a common point of intersation Explain.

Sol:-

The given system of eq is

$$2x_1+4x_2+4x_3=4$$
$$x_2-2x_3=-2$$
$$2x_1+3x_2=0$$

$$[A|b]=\left[\begin{array}{ccc|c} 2 & 4 & 4 & 4 \\ 0 & 1 & -2 & -2 \\ 2 & 3 & 0 & 0 \end{array}\right]$$

$$\underset{\sim}{R}\left[\begin{array}{ccc|c} 1 & 2 & 2 & 2 \\ 0 & 1 & -2 & -2 \\ 2 & 3 & 0 & 0 \end{array}\right] 1/2R_1$$

$$\underset{\sim}{R}\left[\begin{array}{ccc|c} 1 & 2 & 2 & 2 \\ 0 & 1 & -2 & -2 \\ 0 & 1 & -4 & -4 \end{array}\right] R_3-2R_1$$

Q18 (26112)

$$\underset{\sim}{R}\left[\begin{array}{ccc|c} 1 & 2 & 2 & 2 \\ 0 & 1 & -2 & -2 \\ 0 & 0 & -6 & -6 \end{array}\right] R_3+R_2$$

$$\underset{\sim}{R}\left[\begin{array}{ccc|c} 1 & 2 & 2 & 2 \\ 0 & 1 & -2 & -2 \\ 0 & 0 & 1 & 1 \end{array}\right] -1/6\,R_3$$

$$\underset{\sim}{R}\left[\begin{array}{ccc|c} 1 & 2 & 2 & 2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{array}\right] R_2+2R_3$$

$$\underset{\sim}{R}\left[\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{array}\right] R_1-2R_2$$

$$(x_1, x_2, x_3)=(0,0,1)$$

The three planes have at least one common point of intersection.

Chapter # 02

Find the Inverse by using Algorithm method

Exercise No 2.2

Question 31 - 33

(26112)

30. $\begin{bmatrix} 3 & 6 \\ 4 & 7 \end{bmatrix}$

Sol:-

$$[A\ I] = \left[\begin{array}{cc|cc} 3 & 6 & 1 & 0 \\ 4 & 7 & 0 & 1 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{cc|cc} 1 & 2 & 1/3 & 0 \\ 4 & 7 & 0 & 1 \end{array}\right] \frac{1}{3} R_1$$

$$\underset{\sim}{R} \left[\begin{array}{cc|cc} 1 & 2 & 1/3 & 0 \\ 0 & -1 & -4/3 & 1 \end{array}\right] R_2 - 4R_1$$

$\because$ 4 7 ; 0 1
∓ 4 ∓ 8 ; 4/3 0
0 -1 -4/3 1

$$\underset{\sim}{R} \left[\begin{array}{cc|cc} 1 & 2 & 1/3 & 0 \\ 0 & 1 & 4/3 & -1 \end{array}\right] -R_2$$

$\because$ 0 ∓ 1 $\mp \frac{4}{3}$ ∓ 1

$$\underset{\sim}{R} \left[\begin{array}{cc|cc} 1 & 0 & -7/3 & 2 \\ 0 & 1 & 4/3 & -1 \end{array}\right] R_1 - 2R_2$$

$\because$ 1 2 1/3 0
∓ 0 ∓ 2 $\mp 2\frac{4}{3}$ ± 2
1 0 7/3 2

$$\text{So } A^{-1} = \begin{bmatrix} -7/3 & 2 \\ 4/3 & -1 \end{bmatrix} \text{Ans.}$$

Date: (26112) Day:

31. $\begin{bmatrix} 1 & 0 & -2 \\ -3 & 1 & 4 \\ 2 & -3 & 4 \end{bmatrix}$

Solution:-

$$[A\ I] = \left[\begin{array}{ccc|ccc} 1 & 0 & -2 & 1 & 0 & 0 \\ -3 & 1 & 4 & 0 & 1 & 0 \\ 2 & -3 & 4 & 0 & 0 & 1 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|ccc} 1 & 0 & -2 & 1 & 0 & 0 \\ 0 & 1 & -2 & 3 & 1 & 0 \\ 2 & -3 & 4 & 0 & 0 & 1 \end{array}\right] R_2+3R_1$$

$\begin{array}{cc} 2 & -4 \\ -2 & +4 \\ \hline 0 & \end{array}$

$$\underset{\sim}{R} \left[\begin{array}{ccc|ccc} 1 & 0 & -2 & 1 & 0 & 0 \\ 0 & 1 & -2 & 3 & 1 & 0 \\ 0 & -3 & 8 & -2 & 0 & 1 \end{array}\right] R_3-2R_1$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|ccc} 1 & 0 & -2 & 1 & 0 & 0 \\ 0 & 1 & -2 & 3 & 1 & 0 \\ 0 & 0 & 2 & 7 & 3 & 1 \end{array}\right] R_3+3R_2$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|ccc} 1 & 0 & -2 & 1 & 0 & 0 \\ 0 & 1 & -2 & 3 & 1 & 0 \\ 0 & 0 & 1 & 7/2 & 3/2 & 1/2 \end{array}\right] \frac{1}{2}R_3 \text{ Ans}$$

(21192)

DATE:

DATE:

Q32) $A = \begin{bmatrix} 1 & 2 & -1 \\ -4 & -7 & 3 \\ -2 & -6 & 4 \end{bmatrix}$

Sol:-

$$[A\ I] \left[\begin{array}{ccc|ccc} 1 & 2 & -1 & 1 & 0 & 0 \\ -4 & -7 & 3 & 0 & 1 & 0 \\ -2 & -6 & 4 & 0 & 0 & 1 \end{array}\right]$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|ccc} 1 & 2 & -1 & 1 & 0 & 0 \\ 0 & -15 & 7 & -4 & 1 & 0 \\ -2 & -6 & 4 & 0 & 0 & 1 \end{array}\right] R_2+4R_1$$

$$\underset{\sim}{R} \left[\begin{array}{ccc|ccc} 1 & 2 & -1 & 1 & 0 & 0 \\ 0 & -15 & 7 & -4 & 1 & 0 \\ 0 & 10 & 6 & 1 & 0 & 0 \end{array}\right] R_3+2R_1$$

$\because$ -4 -7 3 | 0 2 0
4 8 -4 | 4 0 0
4 1 0
$\because$ -2 -6 4 | 0 0 1
2 4 -2 | 2 0 0
0 10

A is singular (not invertible).
it's inverse can't made

NEXT PAGE

(21112)

Q33) Using algorithm from this section to find the inverse of

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

Let A be the corresponding $n \times n$ matrix and let B be its inverse. Guess the form of B and then show that $AB = I$

Sol:-

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

we need to find $B = A^{-1}$ such that $AB = I$

Use augmented matrix:

$$[A\,I] = \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 \end{array}\right]$$

$$R \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & -1 & 1 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 \end{array}\right] R_2 - R_1$$

$$R \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & -1 & 1 & 0 \\ 0 & 1 & 1 & -1 & 0 & 1 \end{array}\right] R_3 - R_1$$

$$R \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & -1 & 1 & 0 \\ 0 & 0 & 1 & 0 & -1 & 1 \end{array}\right] R_3 - R_2$$

Identify inverse matrix B.

$$B = A^{-1} = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$$

Verify $AB = I$

$$AB = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$$

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

$AB = I$

Hence proved.

The END FINISHED ASSIGNMENT 01 WITH THE GIVEN QUESTIONS