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Degree ★ BS cs

Section ★ 1

Paper ★ Linear Algebra

Q NO 1.

Ans:

$$\begin{bmatrix} 1 & 0 & 3 & 0 & 5 \\ 0 & 1 & -5 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

Multiplying R_3 -3 and the add to R_1.

$$\begin{bmatrix} 1 & 0 & 3-3 & 0 & 23 \\ 0 & 1 & -5 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 23 \\ 0 & 1 & -5 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

Multiplay R_3 by 5 and then add to R_2

$5R_3 + R_2$

$$\left[\begin{array}{ccccc} 1 & 0 & 0 & 0 & 23 \\ 0 & 1 & -5+5 & 0 & -23 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right] \quad 5R_3 + R_2$$

$$\left[\begin{array}{ccccc} 1 & 0 & 0 & 0 & 23 \\ 0 & 1 & 0 & 0 & -23 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

so this is the final linear equation system

$x_1 = 23$
$x_2 = -23$
$x_3 = -6$
$x_4 = 0$

Verification

$23 + 3(-6) = 5$
$23 - 18 = 5$
$5 = 5 \rightarrow$ ture

$-23 - 5(-6) = 7$
$-23 + 30 = 7$
$7 = 7$ true

Q2 :-

Ans :- Part (A)

Matrix 1

$$\begin{pmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2 & -5 & -1 \end{pmatrix} \quad \begin{pmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & -2 \\ 0 & 0 & 3 & -5 \end{pmatrix}$$

Matrix 1 + Matrix 2

$$\begin{pmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2 & -5 & -1 \end{pmatrix}$$

$R_3 - 2R_2$

$$\begin{pmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2-2 & -5+8 & -4-1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0 & 3 & -5 \end{pmatrix} \rightarrow$$ This now matrix (2)

Matrix 2 to matrix (1)

$$\begin{pmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0 & 3 & -5 \end{pmatrix}$$

$R3 + 2R2$

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0+2 & 3+(-8) & -5+4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2 & -5 & 1 \end{bmatrix}$$

so this matrix (1)

Part (b)

1a) $\begin{bmatrix} e & 0 & 0 & 0 \\ 0 & \pi & 0 & 0 \\ 0 & 0 & -\pi & 0 \\ 0 & 0 & 0 & e \end{bmatrix}$ is in echelon from.

$$\begin{bmatrix} e & 0 & 0 & 0 \\ 0 & \pi & 0 & 0 \\ 0 & 0 & -\pi & e \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} -2 & 0 & 35 \\ 0 & 8 & -34 \\ 4 & 0 & 29 \\ 0 & 0 & 0 \end{bmatrix}$$

$R_3 + 2R_1$

$$\begin{bmatrix} -2 & 0 & 35 \\ 0 & 8 & -34 \\ 0 & 0 & 29 \\ 0 & 0 & 0 \end{bmatrix}$$

This is in echelon from.

$R_3 \leftrightarrow R_4$

$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ 1 & -4 & 15 \\ 0 & 0 & 0 \end{bmatrix}$$

$4R_1 - 3R_2$

$$\begin{bmatrix} -2 & 0 & 35 \\ 2 & 8 & -1 \\ 1 & -4 & 15 \\ 0 & 0 & 0 \end{bmatrix} \quad R_3 \leftrightarrow R_4$$

$4R_1 - 3R_2$

$$\begin{bmatrix} -2 & 0 & 35 \\ 2 & 8 & -1 \\ 1 & -4 & 15 \\ 0 & 0 & 0 \end{bmatrix} \quad 4R_1 - 3R_2$$

$2R_3 + R_2$

$$\begin{bmatrix} -2 & 0 & 35 \\ 2 & 8 & -1 \\ 4 & 0 & 29 \\ 0 & 0 & 0 \end{bmatrix} \quad 2R_3 + R_2$$

$R_2 + R_1$

$$\begin{bmatrix} -2 & 0 & 35 \\ 2-2 & 8+0 & -1+35 \end{bmatrix} \quad R_2 + R_1$$

Reduced Row (column) Echelon form:- A matrix is said to be in reduced row (column) echelon from when it satisfies the following conditions.

Row (column) Echelon from:-

A matrix is said to be in row (column) echelon from when it satisfies the following condition

1- The frist non-zero element in each row (column), called the leading entry, is 1.

2- Each leading entry is in a column (row) to the right of the leading entry in the previous row (column).

For example:-

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

Part (b)

$$\begin{pmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ 0 & 0 & 0 \\ 1 & -4 & 15 \end{pmatrix}$$

Q3

Part (A)

Ans:-

Reduced Row (column) Echelon from:-

A matrix is said to be the reduced row (colum) echelon from when if satisfies the following conditions:

1- The matrix satisfies condition for a row (column) echelon from.

2- The leading entry in each row (colum) is the only non-zero entry its column (row)

For example:-

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$