

BILAL

ID = 16020

= BS (C.S.)

= ~~A~~ 2nd Semester

BILAL-10-16020

①

Q) Find the elementary row operation that transform the first matrix into.

① Second and reverse row operation that transforms the second matrix into first

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

Soln-

Matrix 1 to 2

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

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2-2 & -5+8 & -4-1 \end{bmatrix} \quad R_3 - 2R_2$$

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

we matrix 2 into 1

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

②

So
$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0+2 & 3+(-3) & -5+4 \end{bmatrix} R_3 + 2R_2$$

So new matrix

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

Below given are the same matrixes. Find which one is the row echelon form and which is reduced row echelon form. Explain in your own words for each of the selection in detail.

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

→ This is echelon form because each leading entry of a row is in a column to the right of the leading entry of the row above it where possible in the matrix.

Also because all entries in a column below a leading entry are zero wherever possible in the matrix.

$$(ii) \begin{bmatrix} 1 & 0 & \pi \\ 0 & 1 & e \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

This matrix is in echelon form because all non-zero rows are above any row of all zeros.

$$(iii) \begin{bmatrix} 5 & 0 & 0 & 7 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 4 \end{bmatrix}$$

It is in reduced row echelon form because each leading entry in a row is the only non-zero entry in its column.

$$(iv) \begin{bmatrix} 1 & 0 & 0 & 7 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 4 \end{bmatrix}$$

This matrix is in reduced row echelon form because the leading entry in each non-zero row is 1 and also because each leading entry in a row is the only non-zero entry in its column.

Q The row echelon form is used to solve the system of linear equations. What is the difference between the row echelon and reduced row echelon form? What is the practical use of reduced row echelon form?

→ Row Echelon form - A rectangular matrix is in echelon or row echelon form, if it has the following properties

1 All non zero rows are above any rows of all zeros

2 Each leading entry of a row is in a column to the right of the leading entry of the row above it

3 All entries in a column below a leading entry are zeros