

Name = Abdullah Abid.

ID = 16453.

Program = SE.

Semester = 2nd.

Paper = Linear algebra.

Name = Abdullah Abid

ID = 16453

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Question No (1)

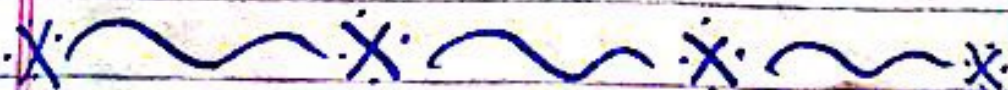
Solution

$$\begin{bmatrix} 1 & 4 & 3 & 0 & 5 \\ 0 & 1 & -3 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 4 \end{bmatrix}$$

$$R \begin{bmatrix} 1 & 0 & 15 & 0 & 33 \\ 0 & 1 & -3 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 4 \end{bmatrix} \quad R_1 - 4R_2$$

$$R \begin{bmatrix} 1 & 0 & 0 & 0 & 123 \\ 0 & 1 & 0 & 0 & -11 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 4 \end{bmatrix} \quad \begin{array}{l} R_1 - 15R_3 \\ R_2 + 3R_3 \end{array}$$

$$R \begin{bmatrix} 1 & 0 & 0 & 0 & 123 \\ 0 & 1 & 0 & 0 & -11 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 4 \end{bmatrix} \quad \text{Ans.}$$



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Question No (2) (a)

Solution (a)

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

First we transform first matrix to second

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

which the required matrix
Now we apply the ~~matrix~~ ^{reverse} row operation to transform second matrix to first.

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

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

Part (B)

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

is echelon form because the entries below the first non zero entry in each row is zero.

b) Same as above.

c) $\begin{bmatrix} 5 & 0 & 0 & 7 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 4 \end{bmatrix}$ is not reduce echelon form because the

first entry in the R_1 is not 1.

d) $\begin{bmatrix} 1 & 0 & 0 & 7 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 4 \end{bmatrix}$ Yes it is reduce echelon form b/c the first non zero in enter R_2 row is 1.

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Also above & below entries
is 1.

Q No (3) (a)

Solution (a)

Difference b/w echelon
& Reduce echelon form.

i) The first non zero entry
in each row in echelon
form is any non zero
number while in reduce
form first non zero entry
is 1.

ii) The entry below the
non zero entry in a
row is zero (0) in the
echelon form while in
the reduce row echelon
form the entry above
& below the first 1 in
each row must be zero.

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Use of Reduce echelon

form = The system of linear equation can be solved by reduce echelon form.

The reduce echelon process for solving system of equation.

For Example: Three straight lines can be solved by reduce echelon form by writing in the augmented matrix as:

$$a_1x + b_1y + c_1 = 0,$$

$$a_2x + b_2y + c_2 = 0$$

$$a_3x + b_3y + c_3 = 0$$

$$\left[\begin{array}{ccc|c} a_1 & b_1 & c_1 & 0 \\ a_2 & b_2 & c_2 & 0 \\ a_3 & b_3 & c_3 & 0 \end{array} \right]$$

Part (B)

$$\left[\begin{array}{ccc|c} 1 & 6 & 8 & \\ 2 & 8 & -1 & \\ -4 & 0 & 0 & \\ 1 & -4 & 13 & \end{array} \right] = \left[\begin{array}{ccc|c} 1 & 6 & 8 & \\ 2 & 8 & -1 & \\ 1 & -4 & 13 & \\ -4 & 0 & 0 & \end{array} \right]$$

changing row

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Now

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & 6 & -3 \\ 1 & -4 & 13 \\ 4 & 0 & 0 \end{bmatrix}$$

subtract
Add -2 from Row 2

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & 1 & -\frac{1}{2} \\ 1 & -4 & 13 \\ -4 & 0 & 0 \end{bmatrix}$$

6 divided by row₂

$$\frac{8}{6}, \frac{8}{6}, \frac{-3}{6}$$
$$0, 1, -\frac{3}{6} \left(\frac{1}{2}\right)$$

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

Adding 3 to ~~row~~
Row₃

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

Add 4 to last
Row

Hence they
are echelon form.

Elementary row operations do not
change solutions of the system
of equations represented by a matrix.

~~~~~~~~~  
The End: