



Mohammad Ali Jinnah University

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Quiz 2

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Id: FA19-BSSE-0014

Subject: Linear Algebra (Fall 2020)

Section: AM

Teacher: Dr. Asmat Ara

Date: Wednesday, November 4, 2020

Linear Algebra

Quiz#2

Instructor Name: Dr. Asmat Ara
Date: 4-11-2020

Total Marks: 10
Time:

Q.1 Find the inverse of the following matrix.

$$Z = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$$

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Q.1 Solution:

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$$
$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & -3 \\ 0 & -2 & 5 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix} \quad \begin{array}{l} -R_1 + R_3 \\ -2R_1 + R_2 \end{array}$$
$$\begin{bmatrix} 1 & 0 & 9 \\ 0 & 1 & -3 \\ 0 & 0 & -1 \end{bmatrix} \quad \begin{bmatrix} 5 & -2 & 0 \\ -2 & 1 & 0 \\ -5 & -2 & 1 \end{bmatrix} \quad \begin{array}{l} -2R_2 + R_1 \\ 2R_2 + R_3 \end{array}$$
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 5 & -2 & 0 \\ -2 & 1 & 0 \\ 5 & -2 & -1 \end{bmatrix} \quad -R_3$$
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} -4 & 0 & 16 & 9 \\ 13 & -5 & -3 \\ 5 & -2 & -1 \end{bmatrix} \quad \begin{array}{l} -9R_3 + R_1 \\ 3R_3 + R_1 \end{array}$$
$$A^{-1} = \begin{bmatrix} -40 & 16 & 9 \\ 13 & -5 & -3 \\ 6 & -2 & -1 \end{bmatrix} \quad \text{Ans.}$$

Q.2 Evaluate rank and nullity of the following matrix

$$A = \begin{bmatrix} 1 & -3 & 4 & -2 & 5 & 4 \\ 2 & -6 & 9 & -1 & 8 & 2 \\ 2 & -6 & 9 & -1 & 9 & 7 \\ -1 & 3 & -4 & 2 & -5 & -4 \end{bmatrix}$$

Date: _____

Q.2

Sol:-

$$\begin{bmatrix} 1 & -3 & 4 & -2 & 5 & 4 \\ 2 & -6 & 9 & -1 & 8 & 2 \\ 2 & -6 & 9 & -1 & 9 & 7 \\ -1 & 3 & -4 & 2 & -5 & -4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & -3 & 4 & -2 & 5 & 4 \\ 0 & 0 & 1 & 3 & -2 & -6 \\ 0 & 0 & 1 & 3 & -1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{array}{l} -2R_1 + R_2 \\ -2R_1 + R_3 \\ -R_1 + R_4 \end{array}$$

$$\begin{bmatrix} 1 & -3 & 0 & -14 & 13 & 28 \\ 0 & 0 & 1 & 3 & -2 & -6 \\ 0 & 0 & 0 & 0 & 1 & 5 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{array}{l} -R_2 + R_3 \\ -4R_2 + R_4 \end{array}$$

$$\begin{bmatrix} 1 & -3 & 0 & -14 & 0 & -37 \\ 0 & 0 & 1 & 3 & 0 & 4 \\ 0 & 0 & 0 & 0 & 1 & 5 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{array}{l} -13R_3 + R_2 \\ 2R_3 + R_2 \end{array}$$

$$\begin{bmatrix} 1 & -3 & 0 & -14 & 0 & -37 \\ 0 & 0 & 1 & 3 & 0 & 4 \\ 0 & 0 & 0 & 0 & 1 & 5 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

MIGHTY PAPER PRODUCT

rank : ~~2~~ 3

Nullity

$$x_1 - 3x_2 - 14x_4 - 37x_6 = (i)$$

$$x_3 + 3x_4 + 4x_6 = (ii)$$

$$x_5 + 5x_6 = (iii)$$

\therefore Let $x_2 = t$, $x_4 = s$ & $x_6 = u$

Now eq/ (i):

$$x_1 = 3x_2 + 14x_4 + 37x_6 \quad \therefore \text{put all the value}$$

$$x_1 = 3t + 14s + 37u \quad (i)$$

$$x_2 = t$$

$$x_3 = -3s - 4u$$

$$x_4 = s$$

$$x_5 = -5u$$

$$x_6 = u$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{bmatrix} = t \begin{bmatrix} 3 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} + s \begin{bmatrix} 14 \\ 0 \\ -3 \\ 1 \\ 0 \\ 0 \end{bmatrix} + u \begin{bmatrix} 37 \\ 0 \\ -4 \\ 0 \\ -5 \\ 1 \end{bmatrix}$$

$$\text{Nullity} = 3 ; \text{ Total no of column} = \text{Nullity} + \text{Rank} \\ = 3 + 3 = 6$$

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