

SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY

VASAD

B. E. Second Semester (All Branch)

Subject: Vector Calculus and Linear Algebra (2110015)

Year 2016-2017

Tutorial: 02

1

Consider the matrix $\begin{bmatrix} 1 & 0 & -2 \\ 0 & 4 & 3 \\ 0 & 0 & 1 \end{bmatrix}$

- (a) Find elementary matrices E_1, E_2 and E_3 such that $E_3 E_2 E_1 A = I_3$
 (b) Write A as a product of elementary matrices.

2 Find the inverse of the given matrices if the matrices are invertible using row operation.

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

$$\begin{bmatrix} 2 & 6 & 6 \\ 2 & 7 & 6 \\ 2 & 7 & 7 \end{bmatrix}$$

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

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

3 Find inverse of matrices using its Adjoint.

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

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

4 Solve the following systems using method of inverting coefficient matrix.

$$x + y + z = 5$$

$$x + 3y + z = 4$$

$$x + y - 4z = 10$$

$$2x + 2y + z = -1$$

$$-4x + y + z = 0$$

$$2x + 3y + z = 3$$

5 Solve the systems in all parts simultaneously.

$$x_1 + 2x_2 + x_3 = b_1$$

$$x_1 - x_2 + x_3 = b_2$$

$$x_1 + x_2 = b_3$$

(a) $b_1 = -1, b_2 = 3, b_3 = 4$

(b) $b_1 = 5, b_2 = 0, b_3 = 0$

(c) $b_1 = -1, b_2 = -1, b_3 = 3$

6 Find condition that the b's must satisfy for the system to be consistent.

$$x_1 - 2x_2 + 5x_3 = b_1$$

$$x_1 - x_2 + 3x_3 + 2x_4 = b_1$$

$$4x_1 - 5x_2 + 8x_3 = b_2$$

$$-2x_1 + x_2 + 5x_3 + x_4 = b_2$$

$$-3x_1 + 3x_2 - 3x_3 = b_3$$

$$-3x_1 + 2x_2 + 2x_3 - x_4 = b_3$$

$$4x_1 - 3x_2 + x_3 + 3x_4 = b_4$$

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7 Find the rank of the following matrices.

$$\begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ 2 & 13 & 10 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 & 2 & 1 \\ 2 & 3 & 3 & 2 \\ 3 & 4 & -1 & 3 \\ 6 & 10 & 4 & 6 \end{bmatrix}$$

$$\begin{bmatrix} 8 & 0 & 0 & 16 \\ 0 & 0 & 0 & 6 \\ 0 & 9 & 9 & 9 \end{bmatrix}$$

$$\begin{bmatrix} 6 & 1 & 1 & 1 \\ 16 & 1 & -1 & 5 \\ 7 & 2 & 3 & 0 \end{bmatrix}$$

8 Find the rank of the matrix $A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & -2 & 6 \\ -6 & 3 & -8 \end{bmatrix}$ in terms of determinants.