

UE18MA251 Linear Algebra and its Applications

Assignment

Answer all.

1. Find the equation of the parabola $y = A + Bx + cx^2$ that passes through 3 points $(1, 1)$, $(2, -1)$ and $(3, 1)$ using Gaussian Elimination.

2. Find the LU decomposition for the matrix.

$$A = \begin{bmatrix} 2 & 5 & 2 & -5 \\ 4 & 12 & 3 & -14 \\ -10 & -29 & -5 & 38 \\ 10 & 21 & 21 & -6 \end{bmatrix}$$

3. Let $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ defined by
 $T(x, y, z) = (x + 2y - z, y + z, x + y - 2z)$.

i) Find the matrix T relative to the standard basis of \mathbb{R}^3 .

ii) Find the basis for 4 fundamental subspaces of T .

iii) Find the eigen values and eigen vectors of T .

iv) Decompose $T = QR$.

4. Fit a best straight line $y = c + dx$ for the following data using least square principles.

x	-4	1	2	3
y	4	6	10	8

5. Find the projection matrices P and Q onto the plane $x_1 + x_2 + 3x_3 + 4x_5 = 0$ and its orthogonal complement respectively.

6. For which range of numbers ' a ', the matrix A is positive definite?

$$A = \begin{bmatrix} a & 2 & 2 \\ 2 & a & 2 \\ 2 & 2 & a \end{bmatrix}.$$

Which 3×3 matrix (symmetric) B produces the function $f = x^T A x$?

where $f = 2(x_1^2 + x_2^2 + x_3^2 - x_1 x_2 - x_2 x_3).$

7. Find the SVD of A , $U \Sigma V^T$ where

$$A = \begin{bmatrix} -3 & 1 \\ 6 & -2 \\ 6 & -2 \end{bmatrix}.$$

USHA