

Linear Algebra assignment 1

Task Requirements Document





Definition of Matrix

1. Given the matrices:

$$A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & 6 & -11 \end{bmatrix}$$

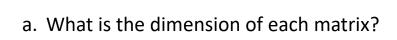
$$B = \begin{bmatrix} 4 & -9 \\ 7 & 2 \\ -5 & 8 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & -3 & 6 \\ -3 & 0 & -5 \\ 6 & -5 & 4 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & 0 & 10 & -7 \end{bmatrix}$$

$$E = \begin{bmatrix} -2\\4\\8\\7 \end{bmatrix}$$

$$F = \begin{bmatrix} 5 & 12 \\ 12 & 5 \end{bmatrix}$$



- b. Which matrices are square?
- c. Which matrices are symmetric?
- d. Which matrix has the entry at row 2 and column 3 equal to -11?
- e. Which matrices have the entry at row 1 and column 3 equal to 10?
- f. Which are column matrices?
- g. Which are row matrices?
- h. Find A^T , C^T , E^T .
- i. Find -3 * B
- j. Find the determinant of C

2. Given the matrices:

$$A = egin{bmatrix} 2 & 0 & 0 \ 0 & -5 & 0 \ 0 & 0 & 7 \end{bmatrix} \quad B = egin{bmatrix} 1 & 3 & 5 \ 0 & 4 & -6 \ 0 & 0 & 9 \end{bmatrix}$$

$$C = \begin{bmatrix} 8 & 0 & 0 \\ -4 & 2 & 0 \\ 7 & -1 & 3 \end{bmatrix} \quad D = \begin{bmatrix} 6 & 1 & -4 \\ 0 & 3 & 2 \\ 0 & 0 & 5 \end{bmatrix}$$

$$E = \begin{bmatrix} 2 & 0 & 0 \\ -5 & 7 & 0 \\ 3 & -4 & 1 \end{bmatrix} \quad F = \begin{bmatrix} 5 & -2 & 1 \\ 0 & 8 & -3 \\ 4 & -7 & 6 \end{bmatrix}$$

- a. Which of the above matrices are diagonal?
- b. Which of the above matrices are lower triangular?
- c. Which of the above matrices are upper triangular?
- d. Find B+E
- e. Find D-E
- f. Find the inverse of A and C, if they exist.
- g. Find the determinant of A, C, and F.



Gaussian Elimination to Solve Systems

- 3. Write the augmented matrix of the system below in reduced row echelon form and find the solution to the given system.
- 4.

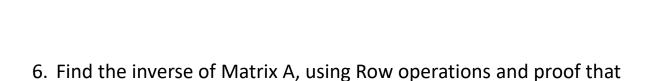
$$2x_1 + 3x_2 - x_3 + 4x_4 = 5$$
 $x_1 - 2x_2 + 3x_3 - x_4 = 7$
 $3x_1 + x_2 - 2x_3 + x_4 = -4$
 $x_1 + 4x_2 - x_3 + 2x_4 = 3$

Matrix Transpose and Inverse

5. Matrices A, B are given by:

$$A = egin{bmatrix} 2 & -3 & 4 \ 1 & 0 & -1 \ 0 & 5 & 6 \end{bmatrix} \quad B = egin{bmatrix} 1 & 2 & 3 \ 4 & 5 & 0 \ 7 & -1 & 2 \end{bmatrix}$$

show that: $(A + B)^T = B^T + A^T$ and $(AB)^T = B^T A^T$



Given that A=

$$A = egin{bmatrix} 4 & 2 & 1 \ 3 & 5 & 2 \ 2 & 3 & 3 \end{bmatrix}$$



Task Programming Language and Technologies



Evaluation Criteria

80% overall solution structure

5% details of all steps

15% Apply methods of linear algebra



Deadline

17/10/2024 at 11:59 pm



