

Problem Set

Chapter 04.01 Introduction

1. Write an example of a row vector of dimension 4.
2. Write an example of a column vector of dimension 4.
3. Write an example of a square matrix of order 4×4 .
4. Write an example of a tri-diagonal matrix of order 4×4 .
5. Write an example of a identity matrix of order 5×5 .
6. Write an example of a upper triangular matrix of order 4×4 .
7. Write an example of a lower triangular matrix of order 4×4 .
8. Which of these matrices are strictly diagonally dominant?

$$(A) \quad [A] = \begin{bmatrix} 15 & 6 & 7 \\ 2 & -4 & 2 \\ 3 & 2 & 6 \end{bmatrix}$$

$$(B) \quad [A] = \begin{bmatrix} 5 & 6 & 7 \\ 2 & -4 & 2 \\ 3 & 2 & -5 \end{bmatrix}$$

$$(C) \quad [A] = \begin{bmatrix} 5 & 3 & 2 \\ 6 & -8 & 2 \\ 7 & -5 & 12 \end{bmatrix}$$

9. Find all the submatrices of

$$[A] = \begin{bmatrix} 10 & -7 & 0 \\ 0 & -0.001 & 6 \end{bmatrix}$$

10. If

$$[A] = \begin{bmatrix} 4 & -1 \\ 0 & 2 \end{bmatrix},$$

what are b_{11} and b_{12} in

$$[B] = \begin{bmatrix} b_{11} & b_{12} \\ 0 & 4 \end{bmatrix}$$

if $[B] = 2[A]$.

11. Are matrix

$$[A] = \begin{bmatrix} 10 & -7 & 0 \\ 0 & -0.001 & 6 \end{bmatrix}$$

and matrix

$$[B] = \begin{bmatrix} 10 & 0 \\ -7 & -0.001 \\ 0 & 6 \end{bmatrix}$$

equal?

12. A square matrix $[A]$ is lower triangular if

- (A) $a_{ij} = 0$ for $i > j$
- (B) $a_{ij} = 0$ for $j > i$
- (C) $a_{ij} = 0$ for $i = j$
- (D) $a_{ij} = 0$ for $i + j = \text{odd integer}$

13. A square matrix $[A]$ is upper triangular if

- (A) $a_{ij} = 0$ for $i > j$
 - (B) $a_{ij} = 0$ for $j > i$
 - (C) $a_{ij} = 0$ for $i = j$
- $a_{ij} = 0$ for $i + j = \text{odd integer}$

Answers to Selected Problems:

1. $[5 \ 6 \ 2 \ 3]$

2.
$$\begin{bmatrix} 5 \\ -7 \\ 3 \\ 2.5 \end{bmatrix}$$

3.
$$\begin{bmatrix} 9 & 0 & -2 & 3 \\ -2 & 3 & 5 & 1 \\ 1.5 & 6 & 7 & 8 \\ 1.1 & 2 & 3 & 4 \end{bmatrix}$$

4.
$$\begin{bmatrix} 6 & 3 & 0 & 0 \\ 2.1 & 2 & 2.2 & 0 \\ 0 & 6.2 & -3 & 3.5 \\ 0 & 0 & 2.1 & 4.1 \end{bmatrix}$$

5.
$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

6.
$$\begin{bmatrix} 6 & 2 & 3 & 9 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 4 & 5 \\ 0 & 0 & 0 & 6 \end{bmatrix}$$

7.
$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ 3 & 1 & 0 & 0 \\ 4 & 2 & 4 & 0 \\ 5 & 3 & 5 & 6 \end{bmatrix}$$

8. (A) Yes (B) No (C) No

9. $[10] \ [-7] \ [0], [0], [-0.001], [6]$

$$\begin{bmatrix} 10 \\ 0 \end{bmatrix}, \begin{bmatrix} -7 \\ -0.001 \end{bmatrix}, \begin{bmatrix} 0 \\ 6 \end{bmatrix}, [10 \ -7 \ 0], [0 \ -0.001 \ 6], \begin{bmatrix} 10 & -7 \\ 0 & -0.001 \end{bmatrix}, \begin{bmatrix} 10 & 0 \\ 0 & 6 \end{bmatrix}, \\ \begin{bmatrix} -7 & 0 \\ -0.001 & 6 \end{bmatrix}, [10,-7], [10,0], [-7,0], [0,6], [0,-0.001], [-0.001,6].$$

10. 8,-2

11. No

12. B

13. A