Unit 1: Linear Algebra Solutions

Question 1

Match the array to the appropriate dimensions:

A. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ — D [2,2]

B. $\begin{bmatrix} 1 & -1 & 1 \end{bmatrix}$ — C [2,3]

C. $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & -5 \end{bmatrix}$ — A [3,3]

D. $\begin{bmatrix} 1 & 4 \\ 2 & 4 \end{bmatrix}$ — B [1,3]

E. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix}$ — E [4,2]

F. $\begin{bmatrix} 2 & 1 & 1 & 2 \\ 1 & 2 & 2 & 1 \end{bmatrix}$ — F [2,4]

Question 2

Find the transpose of the following arrays:

$\mathbf{A} = \begin{bmatrix} 6 & 1 & 3 & 2 \\ 1 & 5 & 2 & 1 \\ 7 & 0 & 2 & 1 \\ 1 & 2 & 3 & 4 \end{bmatrix}$ $\mathbf{A}.\mathrm{T} = \begin{bmatrix} 6 & 1 & 7 & 1 \\ 1 & 5 & 0 & 2 \\ 3 & 2 & 2 & 3 \\ 2 & 1 & 1 & 4 \end{bmatrix}$

$\mathbf{B} = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 3 & 2 \end{bmatrix}$ $\mathbf{B}.\mathrm{T} = \begin{bmatrix} 2 & 1 \\ 1 & 3 \\ 1 & 2 \end{bmatrix}$

Question 3

What is the L^2 norm (also known as the euclidean norm) of vector $\mathbf{x}$?

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

$||\mathbf{x}||_2 = \sqrt{(1)^2 + (2)^2 + (3)^2 + (4)^2} = \sqrt{1 + 4 + 9 + 16} = \sqrt{30}$

Question 4

Match the appropriate name to each matrix:

A. $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ — B Diagonal Matrix

B. $\begin{bmatrix} 5 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -4 \end{bmatrix}$ — A Symmetric Matrix

Question 5

When normalizing a vector, which norm is used to find the magnitude of the vector?

a. L^1 norm
b. L^2 norm
c. Max norm
d. Frobenius norm