Worksheet - Lecture 2

Introduction to Linear Algebra Part Two

1. Use the following matrices or vectors to answer the following questions:

$$\mathbf{A} = \begin{pmatrix} 1 & 3 & 8 \\ 3 & 0 & -2 \\ 8 & -2 & -3 \end{pmatrix} \quad \mathbf{M} = \begin{pmatrix} 1 & 8 & -2 & 5 \\ 2 & 8 & 1 & 7 \end{pmatrix} \quad \mathbf{D} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

$$\mathbf{v} = \begin{pmatrix} 6 \\ 3 \\ -1 \\ 2 \end{pmatrix} \quad \mathbf{u} = \begin{pmatrix} 6 & 4 & 8 & 1 \end{pmatrix}$$

   a. Write the following matrices or vectors:

   $\mathbf{M}^T =$ $\mathbf{v}^T =$

   $\mathbf{A}^T =$ $\mathbf{u}^T =$

   $(\mathbf{M}^T)^T =$

   b. Which of these matrices is symmetric?

   c. Can a rectangular matrix be symmetric?

   d. What is $Tr(\mathbf{A})$?

   e. If possible, compute $Tr(\mathbf{M})$. If not possible, explain why.

2. Write out the following matrices or vectors:

$\mathbf{I}_2 =$ $\mathbf{e}_3 \in \mathbb{R}^5 =$

$diag\{\sigma_1, \sigma_2, \sigma_3\} =$

3. If a matrix $\mathbf{M}$ is upper triangular than $\mathbf{M}^T$ is _____

4. If $\mathbf{S}$ is a diagonal matrix, then $\mathbf{S}_{12} =$_____