

Name: SOLUTIONS
Student ID: _____

Quiz 3

Question 1. (4 marks) Determine which of the following expressions are defined for the matrices

$$A_{5 \times 6} \quad B_{5 \times 6} \quad C_{4 \times 2} \quad D_{5 \times 4} \quad E_{6 \times 4}$$

For those that are defined give the size (dimensions) of the resulting matrix.

a) $AE + D$ 5×4

b) AB^T 5×5

c) $(AE)C$ 5×2

d) $E(C - D)$ UNDEFINED

Question 2. (6 marks)

Given: $A = \begin{bmatrix} 1 & 0 \\ 1 & -2 \\ 1 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 5 \\ 3 & 0 \\ 2 & -3 \end{bmatrix}$ $C = \begin{bmatrix} 1 & 6 \\ -1 & 1 \end{bmatrix}$ $D = \begin{bmatrix} 1 & 0 \\ 3 & -1 \end{bmatrix}$

Find:

a) $\frac{1}{2}(C - D) = \frac{1}{2} \left(\begin{bmatrix} 1 & 6 \\ -1 & 1 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 3 & -1 \end{bmatrix} \right) = \frac{1}{2} \begin{bmatrix} 0 & 6 \\ -4 & 2 \end{bmatrix} = \begin{bmatrix} 0 & 3 \\ -2 & 1 \end{bmatrix}$

b) $\text{tr}(6C) = \text{tr} \left(6 \begin{bmatrix} 1 & 6 \\ -1 & 1 \end{bmatrix} \right) = \text{tr} \left(\begin{bmatrix} 6 & 36 \\ -6 & 6 \end{bmatrix} \right)$
 $= 6 + 6 = 12$

c) $A^T B = \begin{bmatrix} 1 & 0 \\ 1 & -2 \\ 1 & 1 \end{bmatrix}^T \begin{bmatrix} 1 & 5 \\ 3 & 0 \\ 2 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 0 & -2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 5 \\ 3 & 0 \\ 2 & -3 \end{bmatrix}$
 $= \begin{bmatrix} 6 & 2 \\ -4 & -3 \end{bmatrix}$