

Quiz 3

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. Consider the following matrices

$$A = \begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 2 \\ -1 & 0 \\ 1 & 1 \end{bmatrix}, C = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & 3 \\ -5 & 0 & 1 \end{bmatrix}, D = [1 \ -2], E = [1 \ 0 \ -2]$$

a. (2 marks) Compute, if possible. Justify.

$$BA$$

3x2 2x2

$$= \begin{bmatrix} 0 & 2 \\ -1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ -1 & 2 \\ 4 & -1 \end{bmatrix}$$

b. (2 marks) Compute, if possible. Justify.

$$(BC)^t$$

B C
3x2 3x3 *not same multiplication not defined*

c. (2 marks) Compute, if possible. Justify.

$$\text{tr}(CC^t)$$

$$CC^t = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & 3 \\ -5 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -5 \\ -1 & 2 & 0 \\ 2 & 3 & 1 \end{bmatrix}$$

d. (2 marks) Compute, if possible. Justify.

$$E^t D - 3B$$

e. (2 marks) Compute, if possible. Justify.

$$\text{tr}(D^t D + AA)$$

$$E^t D - 3B$$

$$= \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix} [1 \ -2] - \begin{bmatrix} 0 & 6 \\ -3 & 0 \\ 3 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -2 \\ 0 & 0 \\ -2 & 4 \end{bmatrix} - \begin{bmatrix} 0 & 6 \\ -3 & 0 \\ 3 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -8 \\ 3 & 0 \\ -5 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 6 & 4 & -3 \\ 4 & 13 & 3 \\ -3 & 3 & 26 \end{bmatrix}$$

$$\therefore \text{tr}(CC^t) = 6 + 13 + 26 = 45$$

$$D^t D + AA$$

$$= \begin{bmatrix} 1 \\ -2 \end{bmatrix} [1 \ -2] + \begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -2 \\ -2 & 4 \end{bmatrix} + \begin{bmatrix} -5 & -4 \\ 6 & -5 \end{bmatrix}$$

$$= \begin{bmatrix} -4 & -6 \\ 4 & -1 \end{bmatrix}$$

$$\therefore \text{tr}(D^t D + AA) = -4 + (-1) = -5$$