

Quiz 1

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 matrices:

$$A = \begin{bmatrix} 1 & 4 & -1 \\ 2 & 0 & 0 \\ 0 & 3 & 3 \end{bmatrix}, B = \begin{bmatrix} 1 & -1 & 6 \\ 3 & 0 & 7 \\ 2 & 11 & 1 \end{bmatrix}, C = \begin{bmatrix} 2 & -1 \\ 1 & 2 \\ 0 & 4 \end{bmatrix}, D = \begin{bmatrix} 3 & 0 & 1 \\ 2 & -1 & 2 \end{bmatrix}$$

Compute the following (where possible).

- a. (1 mark) $B - A$
- b. (1 mark) $D - C$
- c. (1 mark) BD
- d. (3 marks) $3 \operatorname{tr}(2CC^t)$
- e. (4 marks) $CD + I - A^2$

a) $\begin{bmatrix} 0 & -5 & 7 \\ 1 & 0 & 7 \\ 2 & 8 & -2 \end{bmatrix}$

b) Not possible since their dimensions are not the same

c) B D Not possible since the dimension do not match.
 3×3 2×3

d) First let's compute $2CC^t = 2 \begin{bmatrix} 2 & -1 \\ 1 & 2 \\ 0 & 4 \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 \\ -1 & 2 & 4 \end{bmatrix} = 2 \begin{bmatrix} 5 & 0 & -4 \\ 0 & 5 & 8 \\ -4 & 8 & 16 \end{bmatrix}$

$\therefore 3 \operatorname{tr}(2CC^t) = 3[10 + 10 + 32] = 156$

e) $\begin{bmatrix} 2 & -1 \\ 1 & 2 \\ 0 & 4 \end{bmatrix} \begin{bmatrix} 3 & 0 & 1 \\ 2 & -1 & 2 \end{bmatrix} + \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 1 & 4 & -1 \\ 2 & 0 & 0 \\ 0 & 3 & 3 \end{bmatrix} \begin{bmatrix} 1 & 4 & -1 \\ 2 & 0 & 0 \\ 0 & 3 & 3 \end{bmatrix}$

$= \begin{bmatrix} 4 & 1 & 0 \\ 7 & -2 & 5 \\ 8 & -4 & 8 \end{bmatrix} + \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 9 & 1 & -4 \\ 2 & 8 & -2 \\ 6 & 9 & 9 \end{bmatrix}$

$= \begin{bmatrix} -4 & 0 & 4 \\ 5 & -9 & 7 \\ 2 & -13 & 0 \end{bmatrix}$