BAE Math 2 Exercise

Teacher: Katia Colaneri

Teaching Assistants: Alessio Fiorentino& Isabella Valdivia

November 23 2023

Exercise 1.
Given the matrices **A** e **B** where:

$$\mathbf{A} = \begin{pmatrix} 1 & 0 & 3 \\ 8 & 2 & 6 \\ 4 & 1 & 5 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} 5 & 1 & 0 \\ 0 & 2 & 1 \\ 5 & 3 & 6 \end{pmatrix}$$

evaluate $A + B$, A^T, $C = 4A$.

Exercise 2.
Given the following matrices

$$\mathbf{A} = \begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} 2 & 1 \\ -1 & 1 \end{pmatrix} \qquad \mathbf{C} = \begin{pmatrix} 0 & 2 \\ -2 & 1 \end{pmatrix},$$

evaluate:

- 2A - B;
- 3A + 2B - 4C;
- - 2A + B + 2C - 2B;
- 3B + 2(2A - C)- (A + B + 2C).

Exercise 3. Given the following matrices

$$\mathbf{A} = \begin{pmatrix} 1 & -1 & 0 \\ -1 & 1 & 1 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} -2 & 1 & -1 \\ 2 & 1 & 1 \\ 1 & 1 & 0 \end{pmatrix} \qquad \mathbf{C} = \begin{pmatrix} 0 & 1 \\ 1 & 1 \\ 0 & -1 \end{pmatrix},$$

evaluate, when possible:

- $A \cdot B$;
- $(B \cdot B) \cdot A$;
- $B + (C \cdot A)$;
- $B \cdot A$;
- $B \cdot A^T$;
- $A^T + B \cdot C$.

Exercise 4.
Evaluate the determinants of the following matrices

$$A = \begin{pmatrix} 2 & 3 \\ 1 & -2 \end{pmatrix}; \qquad B = \begin{pmatrix} -11 & 3 \\ 2 & 0 \end{pmatrix}; \qquad C = \begin{pmatrix} 2 & 3 & -2 \\ 1 & -2 & 0 \\ 0 & -1 & 2 \end{pmatrix};$$

$$D = \begin{pmatrix} 2 & -2 & -2 \\ 1 & 1 & 0 \\ -3 & 4 & 0 \end{pmatrix}; \quad E = \begin{pmatrix} 7 & 0 & 0 \\ 1 & 1 & 0 \\ -3 & 4 & -3 \end{pmatrix}; \quad F = \begin{pmatrix} 1 & -4 & 2 \\ 0 & 2 & -1 \\ 0 & 0 & 5 \end{pmatrix};$$

$$G = \begin{pmatrix} -2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{pmatrix}; \qquad H = \begin{pmatrix} 1 & 2 & 2 & 3 \\ 4 & 1 & -1 & 2 \\ 3 & 6 & 6 & 8 \\ 3 & 2 & 1 & 3 \end{pmatrix}.$$

Exercise 5.
When possible evaluate the inverse of the following matrices

$$A = \begin{pmatrix} 1 & 2 \\ 2 & -1 \end{pmatrix} \quad B = \begin{pmatrix} 1 & -4 & 2 \\ 0 & 2 & -1 \\ 0 & 0 & 5 \end{pmatrix} \quad C = \begin{pmatrix} 1 & -1 & 3 \\ 1 & 1 & 2 \\ 2 & 0 & 7 \end{pmatrix}$$

Exercise 6.
Let A be the following matrix

$$A = \begin{pmatrix} 1 & k & 0 \\ 0 & 1 & k-4 \\ 2 & k & 0 \end{pmatrix}$$

a) establish for which valus of k the matrix A is invertible;

b) for the k values of the question a), determine the inverse of A.

Exercise 7.
Given the matrix A

$$A = \begin{pmatrix} 2 & 0 & 5 \\ -4k & 4k-1 & k-2 \\ 0 & 1-4k & 0 \end{pmatrix}$$

are there values for k such that the matrix is invertible?.

Exercise 8.
Given the matrices

$$A = \begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix},$$

verify the property

$$(A \cdot B)^{-1} = B^{-1} \cdot A^{-1}.$$

Moreover verify that

$$\left(A^T\right)^{-1} = \left(A^{-1}\right)^T.$$