الجامعة اللبنانية
UNIVERSITE LIBANAISE

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FACULTY OF INFORMATION - BRANCH I
DEPARTMENT OF DATA SCIENCE

Problem 1.
Part A.

Consider the matrices $A = \begin{bmatrix} 0 & 1 & 2 & 0 \\ 0 & 5 & 0 & -1 \\ 2 & 0 & 3 & 4 \\ 0 & -1 & 1 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

1. Compute the following determinants:
   a) $\det(A)$
   b) $\det(A^{-1})$
   c) $\det(A^T A)$
   d) $\det(A^T - A)$

2. Calculate the following operations:
   a) BC
   b) B^2
   c) C^2
   d) $(B - C)^2$

3. Compare $(B - C)^2$ and $B^2 - 2BC + C^2$

Part B.

Let $D = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & 6 \\ 1 & 1 & 4 \end{bmatrix}$ an (3x3) square matrix.

1. Suppose a row operation is applied to D, Find the inverse of D, D^{-1}.
2. Compute the determinants of D.
3. Calculate the adjoint matrix of D, Adj(D) .
4. Find the inverse of D by another method.