

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531** . You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. (5 marks) Solve for the matrix A where

$$A^T \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix} = \left(\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} - 2(A^{-1})^T \right)^{-1}$$

Question 2. (4 marks) Show that if A , B , and $A + B$ are invertible matrices with the same size, then $A(A^{-1} + B^{-1})B(A + B)^{-1} = I$. What does that equation imply about $A^{-1} + B^{-1}$? Justify.

Question 3. (3 marks) Determine whether the following statement is true or false. If the statement is false provide a counterexample. If the statement is true provide a proof of the statement.

A square matrix containing a row of zeros cannot be invertible.