

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. (3 marks each) 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. If A is row equivalent to an elementary matrix, then the system $A\mathbf{x} = \mathbf{b}$ is consistent for all \mathbf{b} .

Question 2. (5 marks) Solve for X where $(\text{trace}(2E)I + X^T)^{-1} = \frac{1}{3}(X^{-1})^T E^T$ and $E = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$.

Question 3. (3 marks) Prove that if A and B are invertible matrices and $(AB)^2 = A^2B^2$ then $AB = BA$

Question 4. (5 marks) Express

$$A = \begin{bmatrix} 0 & 2 & 0 \\ 1 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix}$$

and A^{-1} as a product of elementary matrices.