

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. (4 marks) Show that $\det(I + 2A^{-1}B^T) = 2^{n-1}\det(\frac{1}{2}A^T + B)$ where A and B are $n \times n$ matrices such that $\det(A) = 2$.

Question 2. (3 marks) **Without** using the formula $\det(\text{adj}(A)) = (\det(A))^{n-1}$. Prove: If $\det(A) = 0$ then $\det(\text{adj}(A)) = 0$. *Hint: Prove by contradiction.*

Question 3. (3 marks) Let $P(2, 0, -1)$, $Q(-2, 4, 1)$, and $R(3, -1, 0)$ be the vertices of a parallelogram with adjacent sides PQ and PR . Find the other vertex S .