

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  $X$  the following equation:

$$(AX + 3I)^{-1}C = BA^{-1}C^T(BA^T C^{-1})^T$$

where  $A = \begin{bmatrix} 13 & 5 \\ 5 & 2 \end{bmatrix}$ ,  $B = \begin{bmatrix} 0 & 1 \\ -2 & 0 \end{bmatrix}$  and  $C = \begin{bmatrix} 5 & 4 \\ 4 & 3 \end{bmatrix}$ .

**Question 2.** (4 marks) Assume that a square matrix  $A$  satisfies  $2A^2 + 5A - 4I = 0$ . Show that  $2A - I$  is invertible and find its inverse in terms of  $A$  and  $I$ .

**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.

If  $A$  and  $B$  are square matrices of the same size then  $(AB)^T = A^T B^T$ .