

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.** (1 mark each) Complete each of the following sentences with MUST, MIGHT, or CANNOT.

If  $A$  is a  $4 \times 4$  matrix and  $B$  is obtained from  $A$  by interchanging the first two rows and then interchanging the last two rows, then  $\det(A)$  \_\_\_\_\_ be equal to  $\det(B)$ .

**Question 1.** (4 marks) Find all the values of  $x$  for which

$$\begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & x & x \\ 1 & x & 0 & x \\ 1 & x & x & 0 \end{vmatrix} = -6$$

**Question 2.** (2 marks) Find  $b$  if

$$\begin{vmatrix} 1 & 2 & 3 & x \\ 1 & 3 & 4 & y \\ 0 & 2 & 3 & z \\ 0 & 0 & 3 & 4 \end{vmatrix} = ax + by + cz + d$$

**Question 3.** (5 marks) Only use elementary operations to show that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (b-a)(c-a)(c-b)$$