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) Given the non-intersecting lines:

$$\mathcal{L}_1$$
: $(x,y,z) = (1,2,-2) + t_1(1,2,1)$

$$\mathscr{L}_2$$
: $(x,y,z) = (2,1,3) + t_2(1,2,3)$ where $t_1, t_2 \in \mathbb{R}$.

Find the shortest distance between \mathcal{L}_1 and \mathcal{L}_2 .

Questions 2. (4 marks) Prove: If \vec{a} , \vec{b} , \vec{c} and \vec{d} lie in the same plane, then $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) = \vec{0}$.

a. (4 marks) Find the area of the triangle ABC.
b. (3 marks) Find the general and parametric equation of the plane that contains the points A, B and C .

Questions 3. Given A(1,2,3), B(0,1,-2) and C(-1,0,5)