Question 1. *(5 marks)* Given the non-intersecting lines:

$$\mathcal{L}_1 \quad : \quad (x,y,z) = (1,2,-2) \quad + \quad t_1(1,2,1)$$
$$\mathcal{L}_2 \quad : \quad (x,y,z) = (2,1,3) \quad + \quad t_2(1,2,3) \text{ where } t_1, t_2 \in \mathbb{R}.$$

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 $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) = \vec{0}$.

$$\mathcal{L}_1 \quad : \quad (x,y,z) = (1,2,-2) \quad + \quad t_1(1,2,1)$$
$$\mathcal{L}_2 \quad : \quad (x,y,z) = (2,1,3) \quad + \quad t_2(1,2,3) \text{ where } t_1, t_2 \in \mathbb{R}.$$

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

  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.