1. Find the area of the triangle whose vertices are given by $A(0,0,0)$, $B(2,3,-1)$ and $C(3,-1,4)$.

   **Solution.** Consider the vectors $\overrightarrow{AB} = \langle 2, 3, -1 \rangle$ and $\overrightarrow{AC} = \langle 3, -1, 4 \rangle$.

   The area of the triangle $ABC$ is half the area of the parallelogram determined by the vectors $\overrightarrow{AB} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\overrightarrow{AC} = 3\hat{i} - \hat{j} + 4\hat{k}$.

   Since $\overrightarrow{AB} \times \overrightarrow{AC} = 11(\hat{i} - \hat{j} - \hat{k})$, we have:

   $$\text{Area}(ABC) = \frac{1}{2} |\overrightarrow{AB} \times \overrightarrow{AC}| = \frac{11\sqrt{3}}{2}.$$ 

2. Find an equation of the line passing through the points $P(1,2,-1)$ and $Q(5,-3,4)$. Either parametric or vector form is fine.

   **Solution.** First find a vector that is parallel to the given line. For example, choose the vector $\overrightarrow{PQ} = \langle 4, -5, 5 \rangle$. Pick either point to get the equations for the line:

   $$\begin{cases} x = 1 + 4t \\ y = 2 - 5t \\ z = -1 + 5t \end{cases}, t \in \mathbb{R}.$$