Math 107, Sect. 250 **Answers to Quiz # 10** **12 April '07**

. 5 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 $\overrightarrow{AB} = 2\vec{\imath} + 3\vec{\jmath} - 1\vec{k}$ and $\overrightarrow{AC} = 3\vec{\imath} - 1\vec{\jmath} + 4\vec{k}$.
Since $\overrightarrow{AB} \times \overrightarrow{AC} = 11(\vec{\imath} - \vec{\jmath} - \vec{k})$, we have:

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

. 5 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:

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