Problem 1. Find the area of a triangle with vertices $O(0,0,0)$, $P(0,1,3)$, and $Q(2,3,4)$.

$$\overrightarrow{OP} = \langle 0,1,3 \rangle \qquad \overrightarrow{OQ} = \langle 2,3,4 \rangle$$

$$\frac{1}{2} |\overrightarrow{OP} \times \overrightarrow{OQ}| = \frac{1}{2} \left| \begin{vmatrix} i & j & k \\ 0 & 1 & 3 \\ 2 & 3 & 4 \end{vmatrix} \right| = \frac{1}{2} \left| i(1\cdot4 - 3\cdot3) - j(0\cdot4 - 2\cdot3) + k(0\cdot3 - 1\cdot2) \right|$$

$$= \frac{1}{2} \left| -5i + 6j - 2k \right| = \frac{1}{2}\sqrt{(-5)^2 + (6)^2 + (-2)^2}$$

$$= \frac{1}{2}\sqrt{25 + 36 + 4} = \frac{1}{2}\sqrt{65}$$

Problem 2. Find an equation of the line passing through the point $P_0(1,2,-3)$ in the direction of $\mathbf{v} = \langle 2,-3,5 \rangle$.

$$r(t) = \langle 1,2,-3 \rangle + t\langle 2,-3,5 \rangle$$

$$= \langle 1+2t, 2-3t, -3+5t \rangle$$

OR

$$x(t) = 1 + 2t$$
$$y(t) = 2 - 3t$$
$$z(t) = -3 + 5t$$