1) Let $\mathbf{u} = \langle 1, 2, -2 \rangle$ and $\mathbf{v} = \langle 1, -3, 2 \rangle$ and $\mathbf{w} = \langle 11, -3, -2 \rangle$

a) Compute $\mathbf{u} \times \mathbf{v}$
b) Find the area of the parallelogram spanned by $\mathbf{u}$ and $\mathbf{v}$.
c) Express $\mathbf{w}$ as a linear combination of $\mathbf{u}$ and $\mathbf{v}$.
d) Find $\mathbf{w} \cdot (\mathbf{u} \times \mathbf{v})$
e) Find $e_u$
f) Find the projection of $\mathbf{v}$ along $\mathbf{u}$
g) Find the point of intersection between the following two lines:
   $$\mathbf{r}(t) = \langle 6 + t, 12 - 3t, -12 + 2t \rangle \quad \mathbf{s}(t) = \langle 5, -15, 10 \rangle + t \langle 1, 2, -2 \rangle$$

2) Suppose $\mathbf{u}$ is a unit vector and suppose $\mathbf{v}$ is a vector with $||\mathbf{v}|| = 2$, for which $||\mathbf{u} + \mathbf{v}|| = \frac{3}{2}$. Find $||4\mathbf{u} - 2\mathbf{v}||$

3) $P = (5, 15, -10), \quad Q = (20, -5, 10), \quad R = (-1, -1, -1), \quad S = (4, 3, -2), \quad T = (-1, 2, 3)$

Find a vector parametrization for the line with the given description:

Line that passes through the point on $\overrightarrow{PQ}$ lying three fifths ($\frac{3}{5}$) of the way from $P$ to $Q$, and is perpendicular to the plane that contains points $R, S,$ and $T$.

4) a) Find the equation of a plane that contains the line $\mathbf{r}(t) = \langle 3t, t, 2t+1 \rangle$ and is perpendicular to the plane $2x - y + 5z = 9001$. Express your answer in 3 forms (one vector form, and two scalar forms).
b) Find $\cos(\theta)$, where $\theta$ is the angle between the plane found in part a) and the xz-plane.