Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Consider the vectors

$$\boldsymbol{u} = \langle 3, -2, -1 \rangle, \quad \boldsymbol{v} = \langle 1, 5, 0 \rangle, \quad \boldsymbol{w} = \langle -1, -1, 3 \rangle.$$

(a) Find the area of the triangle with sides $\boldsymbol{u}$ and $\boldsymbol{v}$.

(b) Find the volume of the parallelepiped spanned by the three vectors $\boldsymbol{u}$, $\boldsymbol{v}$ and $\boldsymbol{w}$.

2. (a) Find an equation for the plane passing through the points $P = (2, 0, 3)$, $Q = (1, 4, 1)$ and $R = (-1, 2, 2)$.

(b) At which point does the line with equation $r(t) = \langle 2 - t, 1 + t, t \rangle$ intersect the plane you found in Part (a)?

3. Find an equation for the plane $\mathcal{P}$ that contains the line $r(t) = \langle 1 + t, -1 + 5t, -1 - 2t \rangle$ and the point $P = (0, 0, 1)$.