Assignment 1

1- Given point $P(1,2,3)$ and vector $\vec{A} = \hat{\imath} + \hat{\jmath}$, find point Q on the x-axis such that $\overrightarrow{PQ}$ & $\vec{A}$ are orthogonal.

2- Find the shortest distance between point $P = (3,1,2)$ and the plane given by $x - 2y + z = 5$.

3- Find a unit vector that is orthogonal to the line

$$x = 2t - 1, y = -t - 1, z = t + 2$$

and the vector $\hat{\imath} - \hat{\jmath}$.

4- A line is given by $\vec{r} = \vec{a} + \lambda\vec{b}$ where $\vec{a} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ and $\vec{b} = 4\hat{\imath} + 5\hat{\jmath} + 6\hat{k}$. Find the coordinates of the point at which the line intersects the plane $2x + y + 3z = 6$.

5- Starting with the vector quadruple product

$$(\vec{A} \times \vec{B}) \times (\vec{C} \times \vec{D})$$

Show that $\vec{D}$ can be expressed as a linear combination of $\vec{A}, \vec{B}, \vec{C}$.