Lines and Planes

Question 1:

Given point $P(2,1,2)$ and $Q(-4,2,-13)$, compute the vector $\overrightarrow{PQ}$.

Question 2:

part a)

Given vector $\mathbf{u} = \begin{bmatrix} 5 \\ -3 \\ -4 \end{bmatrix}$, compute $|\mathbf{u}|$.

part b)

Compute a unit vector that shares the direction of $\mathbf{u}$.

Question 3:

part a)

Given vectors $\mathbf{u} = \begin{bmatrix} 7 \\ -2 \\ 9 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -3 \\ -1 \\ 2 \end{bmatrix}$, compute $\mathbf{u} \cdot \mathbf{v}$ and $\mathbf{u} \times \mathbf{v}$.

part b)

With $\mathbf{w} = \begin{bmatrix} -3 \\ -1 \\ 3 \end{bmatrix}$, compute the scalar triple product $\mathbf{u} \cdot (\mathbf{v} \times \mathbf{w})$. What is the volume of a parallelepiped bounded by $\mathbf{u}$; $\mathbf{v}$; and $\mathbf{w}$?

Question 4:

part a)

Given vector $\mathbf{u} = \begin{bmatrix} 2 \\ 5 \\ -7 \end{bmatrix}$ and vector $\mathbf{v} = \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$, find x and y such that $\mathbf{u}||\mathbf{v}$.

part b)

Given vector $\mathbf{u} = \begin{bmatrix} 2 \\ 5 \\ -3 \end{bmatrix}$ and vector $\mathbf{v} = \begin{bmatrix} -1 \\ 1 \\ z \end{bmatrix}$, find z such that $\mathbf{u} \perp \mathbf{v}$.

Question 5:

Given points $P(2,5,3)$, $Q(-1,-4,5)$, and $R(-4,2,2)$,

part a)

Find a parametric equation, and implicit equation, of a line that passes through P and Q.

part b)

Find a parametric equation, and implicit equation, of a plane that passes through P, Q, and R.

Question 6:

Given points $P(5,0,0)$, $Q(0,4,0)$, and $R(0,0,3)$, find the length of the altitude of triangle ΔPQR descending from point R onto line segment PQ.

Question 7: