

1. (7pts) Consider three points $P(1, -2, 1)$, $Q(2, -1, 0)$, $R(3, -2, 2)$ in space.

a. Find the vectors \vec{PQ} and \vec{PR} .

b. Compute $\vec{PQ} \times \vec{PR}$

c. Find the area of the parallelogram formed by vectors \vec{PQ} and \vec{PR} .

d. Give the parametric equations of the line L_1 that passes through points P and Q .

e. Give the symmetric equations of the line L_2 that passes through point Q and is perpendicular to both vectors \vec{PQ} and \vec{PR} .

f. Find an equation of the plane containing points P , Q and R .

2. (4pts) Determine whether the lines $\begin{cases} x = 3 + t \\ y = 2 + 3t \\ z = 4 - t \end{cases}$ and $\begin{cases} x = 2 - s \\ y = 1 - 2s \\ z = 7 + 2s \end{cases}$ are parallel, perpendicular, skew or intersect. If it is intersect, find the intersection.