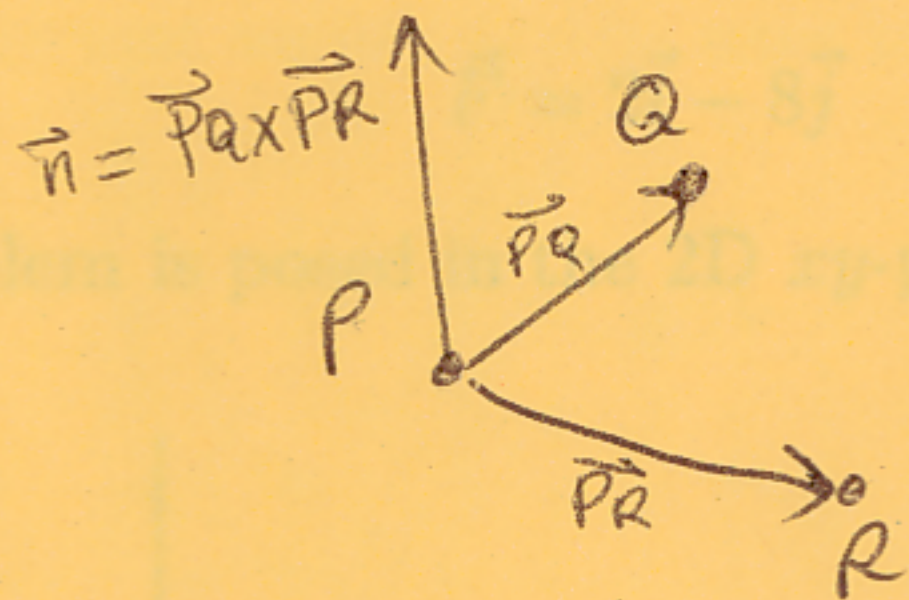


1. Let  $P = (1, 4, -2)$ ,  $Q = (1, 1, 2)$ ,  $R = (4, 0, 5)$  be three points in space.

(a) Give the equation of the plane passing through  $P, Q$ , and  $R$ .



$$\vec{PQ} = \langle 0, -3, 4 \rangle$$

$$\vec{PR} = \langle 3, -4, 7 \rangle$$

$$\vec{PQ} \times \vec{PR} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 0 & -3 & 4 \\ 3 & -4 & 7 \end{vmatrix}$$

$$= \langle -21 + 16, -(0 - 12), (0 + 9) \rangle$$

$$\vec{n} = \langle -5, 12, 9 \rangle$$

Equation of a plane:

$$\vec{n} \cdot \langle x - x_0, y - y_0, z - z_0 \rangle = 0$$

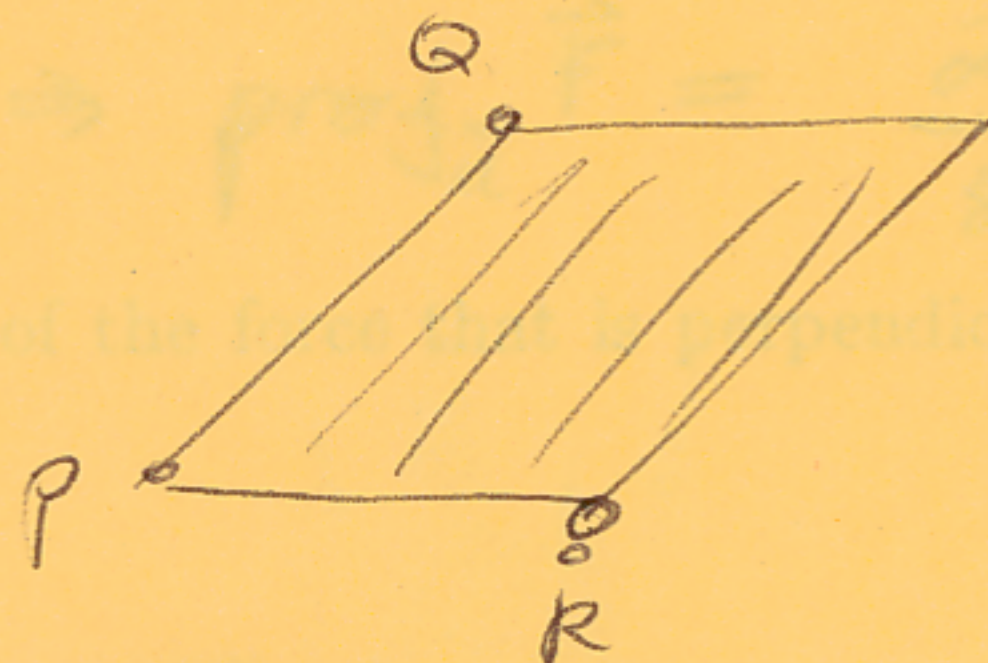
•  $(x_0, y_0, z_0) = \text{pt on plane} = (1, 1, 2)$

•  $\vec{n} = \langle -5, 12, 9 \rangle$

$$\Rightarrow \boxed{-5(x-1) + 12(y-1) + 9(z-2) = 0}$$

(b) What's the area of the triangle formed by  $P, Q$ , and  $R$ ?

$|\vec{PQ} \times \vec{PR}| = \text{area of parallelogram formed by } PQR:$



$\Rightarrow$

$$\frac{1}{2} |\vec{PQ} \times \vec{PR}| = \text{area of } \triangle PQR.$$

$$= \frac{1}{2} \sqrt{5^2 + 12^2 + 9^2}$$