

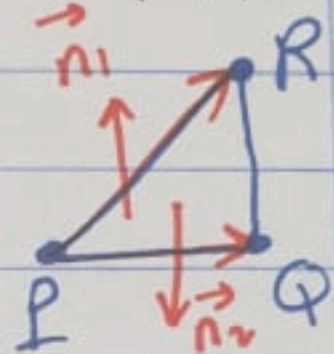
## 12.4 Lecture Problems

1

17. Find Area of triangle determined by the points  $P(2, -2, 1)$ ,  $Q(3, -1, 2)$ ,  $R(3, -1, 1)$
- Find unit vector  $\perp$  plane  $PQR$

$$\vec{PQ} = \vec{i} + \vec{j} + \vec{k}$$

$$\vec{PR} = \vec{i} + \vec{j}$$



$$\vec{PQ} \times \vec{PR} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 1 \\ 1 & 1 & 0 \end{vmatrix} = -\vec{i} + \vec{j}$$

$$\text{Area of Triangle} = \frac{|\vec{PQ} \times \vec{PR}|}{2} = \frac{\sqrt{1+1}}{2} = \frac{1}{\sqrt{2}}$$

unit vector  $\perp$  plane  $PQR$  is

$$\vec{n}_1 = \frac{\vec{PQ} \times \vec{PR}}{|\vec{PQ} \times \vec{PR}|} = \frac{1}{\sqrt{2}} (-\vec{i} + \vec{j})$$

$$\vec{n}_2 = \frac{-1}{\sqrt{2}} (-\vec{i} + \vec{j})$$

[33] If  $\vec{u} \neq 0$  and  $\vec{u} \times \vec{v} = \vec{u} \times \vec{w}$

[2]

then does  $\vec{v} = \vec{w}$ ? Give reasons

No  $\Rightarrow$  Exp

$$\vec{u} = \vec{i}$$
$$\vec{v} = -\vec{i} + \vec{j}$$
$$\vec{w} = \vec{i} + \vec{j}$$

$\vec{u} \neq 0$

$\vec{v} \neq \vec{w}$

$$\begin{aligned}\vec{u} \times \vec{w} &= \vec{i} \times (\vec{i} + \vec{j}) \\ &= \vec{i} \times \vec{i} + \vec{i} \times \vec{j} \\ &= 0 + \vec{k} \\ &= \vec{k}\end{aligned}$$

$$\begin{aligned}\vec{u} \times \vec{v} &= \vec{i} \times (-\vec{i} + \vec{j}) \\ &= -\vec{i} \times \vec{i} + \vec{i} \times \vec{j} \\ &= 0 + \vec{k} \\ &= \vec{k}\end{aligned}$$

