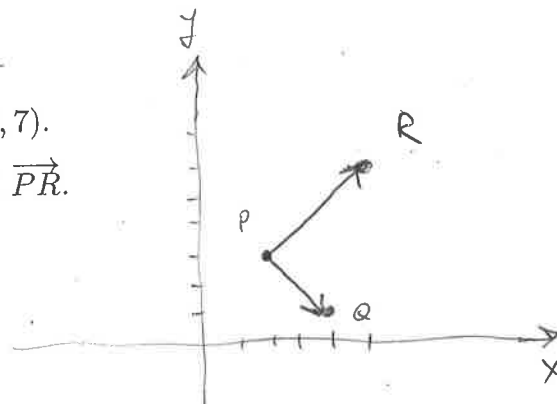


Quiz 1

Name: key

1. Three points in the  $xy$ -plane are  $P(2, 3)$ ,  $Q(4, 1)$ , and  $R(5, 7)$ .

a) Plot the points in the plane and draw the vectors  $\vec{PQ}$  and  $\vec{PR}$ .



[3]

[4]

b) Find the cosine of the angle between  $\vec{PQ}$  and  $\vec{PR}$ .

①  $\vec{PQ} = \langle 4-2, 1-3 \rangle = \langle 2, -2 \rangle$

$\vec{PR} = \langle 5-2, 7-3 \rangle = \langle 3, 4 \rangle$

②  $\cos \theta = \frac{\vec{PQ} \cdot \vec{PR}}{|\vec{PQ}| |\vec{PR}|} = \frac{2 \cdot 3 + (-2) \cdot 4}{\sqrt{2^2 + (-2)^2} \sqrt{3^2 + 4^2}} = \frac{-2}{\sqrt{8} \sqrt{25}} = \boxed{\frac{-2}{10\sqrt{2}}}$

2. A line  $L$  passes through the point  $P(2, 1, 7)$  and is parallel to the vector  $\mathbf{v} = \langle 1, -1, 3 \rangle$ .

[3] a) Give parametric equations for  $L$ .

① 
$$\begin{cases} x = 2 + 1 \cdot t \\ y = 1 + (-1)t \\ z = 7 + 3 \cdot t \end{cases}$$

[3] b) Give symmetric equations for  $L$ .

① 
$$\frac{x-2}{1} = \frac{y-1}{-1} = \frac{z-7}{3}, \text{ or } x-2 = 1-y = \frac{z-7}{3}$$

c) Find the point where  $L$  intersects the plane  $x + y + z = 1$ . Show your work.

[7] 
$$\begin{aligned} x + y + z = 1 &\Rightarrow (2+t) + (1-t) + (7+3t) = 1 \quad \textcircled{2} \\ &\Rightarrow 10 + 3t = 1 \Rightarrow 3t = -9 \\ &\Rightarrow t = -3, \quad \textcircled{2} \end{aligned}$$

so 
$$\begin{cases} x = 2 + (-3) = -1 \\ y = 1 - (-3) = 4 \\ z = 7 + 3(-3) = -2 \end{cases} \quad \textcircled{3}$$

The point is  $(-1, 4, -2)$ .