

Answers :

$$(1) \text{ (i) } \vec{OP} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}, \vec{PQ} = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$$

$$\therefore \vec{PQ} = \vec{OQ} - \vec{OP}$$

$$\vec{OQ} = \vec{PQ} + \vec{OP}$$

$$= \begin{pmatrix} 2 \\ 7 \end{pmatrix} + \begin{pmatrix} 3 \\ -4 \end{pmatrix}$$

$$= \begin{pmatrix} 5 \\ 3 \end{pmatrix}$$

Coordinates of P $(3, -4)$ and Q $(5, 3)$

Equation of PQ is

$$\frac{y-3}{x-5} = \frac{3-(-4)}{5-3} = \frac{7}{2}$$

$$2y - 6 = 7x - 35$$

$$2y = 7x - 29$$

(ii) Let M be the mid-point of PQ

$$\therefore M \left(\frac{5+3}{2}, \frac{3-4}{2} \right)$$

$$= M \left(4, -\frac{1}{2} \right)$$

Position vector of M is $\begin{pmatrix} 4 \\ -\frac{1}{2} \end{pmatrix}$