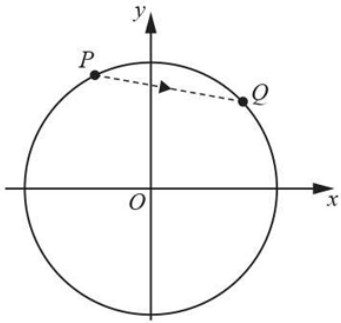
**4** **(a)** The points $A$, $B$ and $C$ lie on a straight line such that $AB = BC$.
The point $M$ is the midpoint of $AB$.
The position vector of $A$ is $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and the position vector of $M$ is $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$.

Determine the position vector of $C$. **[3]**

**(b)**




The points $P$ and $Q$ lie on a circle whose centre is at the origin, $O$.
The point $P$ has position vector $-2\mathbf{i}+4\mathbf{j}$.
The point $Q$ is such that $\overrightarrow{PQ} = k(3\mathbf{i}-\mathbf{j})$ where $k$ is a constant.

**(i)** Find the exact radius of the circle. **[1]**

**(ii)** Write down an expression for $\overrightarrow{OQ}$ in terms of $k$. **[1]**

**(iii)** Hence determine the two values of $k$. **[4]**

**(iv)** State what the value $k = 0$ shows about one of the two possible positions of $Q$. **[1]**