5 The volume, V, of a sphere of radius r is given by $V = \frac{4}{3}\pi r^3$.

The volume of a sphere is increasing at a constant rate of $24\,\text{cm}^3\,\text{s}^{-1}$. Find the rate of increase of the radius when the radius is 6 cm. [4]

6 **(a)** The position vectors of the points P, Q and R relative to an origin O are $\begin{pmatrix}4\\7\end{pmatrix}$, $\begin{pmatrix}8\\5\end{pmatrix}$ and $\begin{pmatrix}x\\y\end{pmatrix}$ respectively. The point R lies on PQ extended such that $3\overrightarrow{QR} = 2\overrightarrow{PR}$. Use a vector method to find the values of x and y. [3]

(b) You are given that **i** is a unit vector due east and **j** is a unit vector due north.

Three vectors, **a**, **b** and **c** are in the same horizontal plane as **i** and **j** and are such that $\mathbf{a} + \mathbf{b} = \mathbf{c}$.
The magnitude and bearing of **a** are 5 and 210°.
The magnitude and bearing of **c** are 10 and 330°.

(i) Find **a** and **c** in terms of **i** and **j**. [2]

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