5 In this question all lengths are in kilometres and time is in hours.

Boat A sails, with constant velocity, from a point O with position vector $\begin{pmatrix}0\\0\end{pmatrix}$. After 3 hours A is at the point with position vector $\begin{pmatrix}-12\\9\end{pmatrix}$.

(a) Find the position vector, $\overrightarrow{OP}$, of A at time t. [1]

At the same time as A sails from O, boat B sails from a point with position vector $\begin{pmatrix}12\\6\end{pmatrix}$, with constant velocity $\begin{pmatrix}-5\\8\end{pmatrix}$.

(b) Find the position vector, $\overrightarrow{OQ}$, of B at time t. [1]

(c) Show that at time t $\left|\overrightarrow{PQ}\right|^2 = 26t^2 + 36t + 180$. [3]

(d) Hence show that A and B do not collide. [2]