12 In this question, the x- and y-directions are east and north respectively. The units are metres and seconds. Boat A starts from the origin O and moves with constant speed $5\sqrt{3}\,\text{ms}^{-1}$ on a bearing of 030°.

After 100 seconds boat B starts from point P, which has position vector $\begin{pmatrix} 0 \\ 1000 \end{pmatrix}$.

Boat B moves with constant speed $10\,\text{ms}^{-1}$ on a bearing of 060°.

(a) Find the velocity of each boat in vector form. [2]

(b) Show that the two boats will collide. [5]

Question 13 is printed on the next page.

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13 Solve the equation $2\sin^3\theta = 3\sin\theta\cos\theta$ for $-\frac{\pi}{2} \leqslant \theta \leqslant \frac{\pi}{2}$. [6]

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