

2. (a) Two particles, A and B, start initially from points with position vectors $6\vec{i} - 14\vec{j}$ and $3\vec{i} - 2\vec{j}$ respectively. The velocities of A and B are constant and equal to $4\vec{i} - 3\vec{j}$ and $5\vec{i} - 7\vec{j}$ respectively.

(i) Find the velocity of B relative to A.

(ii) Show that the particles collide.

$$\begin{aligned} \vec{V}_A &= 4\vec{i} - 3\vec{j} \\ \vec{V}_B &= 5\vec{i} - 7\vec{j} \\ \vec{V}_{BA} &= \vec{V}_B - \vec{V}_A \\ &= \vec{i} - 4\vec{j} \end{aligned}$$

magnitude = $\sqrt{17} \text{ m s}^{-1}$ or slope = -4
or direction = East 75.58° South

$$\begin{aligned} \vec{R}_A &= 6\vec{i} - 14\vec{j} \\ \vec{R}_B &= 3\vec{i} - 2\vec{j} \\ \vec{R}_{AB} &= \vec{R}_A - \vec{R}_B \\ &= 3\vec{i} - 12\vec{j} \text{ or } 3(\vec{i} - 4\vec{j}) \end{aligned}$$

slope = -4
or direction = East 75.58° South

\Rightarrow The particles collide

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