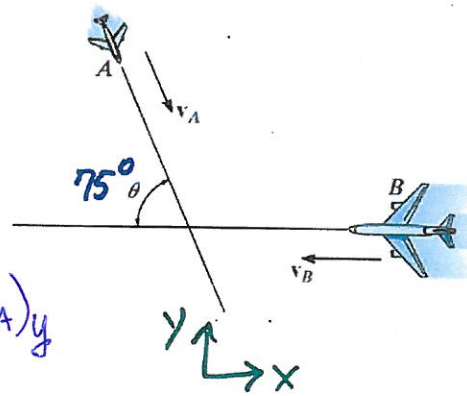


Problem 1: Particle Kinematics II

Two planes, *A* and *B*, are flying at the same altitude. If their velocities are $v_A = 600$ km/h and $v_B = 500$ km/h such that the angle between straightline courses is $\theta = 75^\circ$, determine the velocity of plane *B* with respect to plane *A*.



$$\vec{V}_B = \vec{V}_A + \vec{V}_{B/A}$$

Diagram illustrating the velocity vectors: \vec{V}_B (500 km/h) is the resultant, \vec{V}_A (600 km/h) is at 75° to the horizontal, and $\vec{V}_{B/A}$ is the relative velocity. The components of $\vec{V}_{B/A}$ are labeled $(V_{B/A})_x$ and $(V_{B/A})_y$.

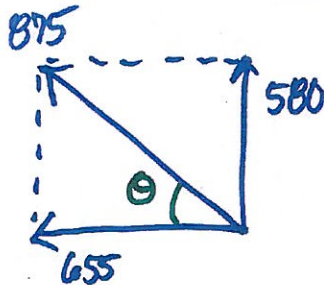
$$x \rightarrow -500 = 600 \cos 75 + (V_{B/A})_x$$

$$(V_{B/A})_x = -655 = 655 \text{ km/h} \leftarrow$$

$$y \uparrow 0 = -600 \sin 75 + (V_{B/A})_y$$

$$(V_{B/A})_y = 580 \text{ km/h} \uparrow$$

$$|\vec{V}_{B/A}| = \sqrt{655^2 + 580^2} = 875 \text{ km/hr}$$



$$\theta = \tan^{-1} \frac{580}{655} = 41.5^\circ$$