

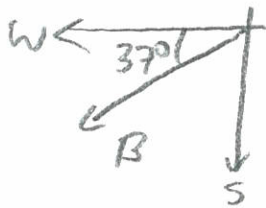
Physics 10154 - Quiz 1B

A Polynesian navigator is trying to sail from Tahiti to Hawaii across the Pacific ocean. For this problem, we will assume the Earth's surface is flat for simplicity. The straight line distance from Honolulu to Tahiti is 2750 miles in a direction 86.0° South of East.

The navigator first follows a straight line distance 1310 miles due South to the island of Kiribati, then 224 miles in a direction 37.0° South of West to Jarvis Island, then 688 miles in a direction 81.0° South of ~~West~~ ^{East} to Penhryn Atoll.

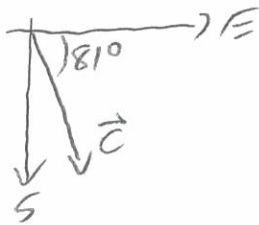
What must be the magnitude and direction of the final leg of the trip?

$\vec{A} = 1310 \text{ mi, South} \Rightarrow A_x = 0 \quad A_y = -1310$



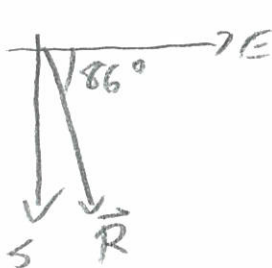
$B_x = -224 \cos 37^\circ = -178.89$

$B_y = -224 \sin 37^\circ = -134.81$



$C_x = +688 \cos 81^\circ = +107.63$

$C_y = -688 \sin 81^\circ = -679.53$



Resultant:

$R_x = 2750 \cos 86^\circ = 191.83$

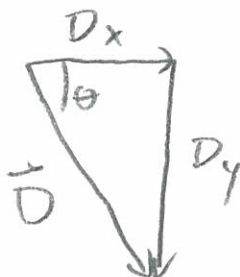
$R_y = -2750 \sin 86^\circ = -2743.30$

$A_x + B_x + C_x + D_x = R_x$

$0 - 178.89 + 107.63 + D_x = 191.83 \Rightarrow D_x = 263.09$

$A_y + B_y + C_y + D_y = R_y$

$-1310 - 134.81 - 679.53 + D_y = -2743.30 \Rightarrow D_y = -618.96$



$|\vec{D}| = \sqrt{D_x^2 + D_y^2}$

$= 673 \text{ mi}$

$\theta = \tan^{-1}\left(\frac{|D_y|}{|D_x|}\right)$

$= 67.0^\circ \text{ S of E}$