Physics 200 (Stapleton)
More non-orthogonal problem practice

Name: Answers

Components	X	Y
B	-1.6	1.2
H	-0.53	-1.77
→ S (resultant)	-2.13	-0.569

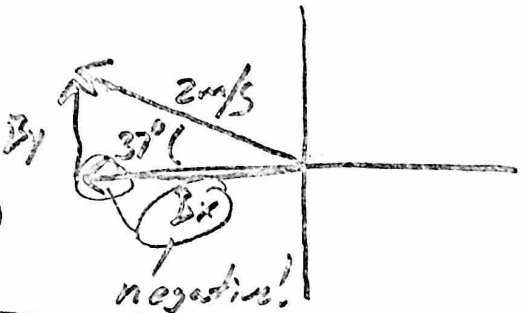
A student is out of her seat, walking across the floor a moving school bus. The bus is traveling in a direction 37° N of W at a speed of 2m/s, but the student's velocity is 2.2m/s in a direction 15° S of W. Find the student's heading and *speed on a still bus*. Let B = bus velocity, S = student velocity, and H = student heading and speed on a still bus.

B = Component H = Component
S = Resultant

a. (1pt) What are the x and y components (N/S and E/W components, actually) of the bus' velocity (B)?

$B_x =$ -1.60 m/s $B_y =$ 1.20 m/s

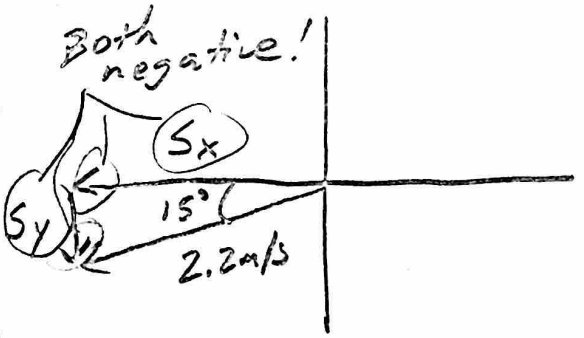
$B_x = \cos 37°(2\text{m/s})$ $B_y = \sin 37°(2\text{m/s})$
$= 1.60\text{m/s}$ $= 1.20\text{m/s}$



b. (1pt) What are the x and y components of the student's velocity (S)?

$S_x =$ -2.13 m/s $S_y =$ -0.569 m/s

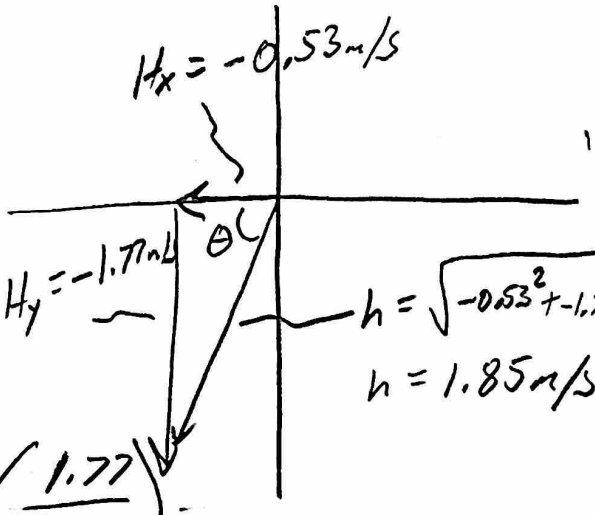
$S_x = 2.2\text{m/s}(\cos 15°)$ $S_y = 2.2\text{m/s}(\sin 15°)$
$= 2.13\text{m/s}$ $= 0.569\text{m/s}$



c. (3pts) What are the x and y components of the student's heading and speed on a still bus (H)?

Use chart (top right) to find these

$H_x =$ -0.53 m/s $H_y =$ -1.77 m/s



d. (3pts) Describe the student's speed and heading (H). For direction, provide a precise angle relative to the x or y axis.

Student speed on a still bus = 1.85 m/s

Student Heading = 73.3° S of W

$\theta = \text{Tan}^{-1}\left(\frac{1.77}{0.53}\right)$
$= 73.3°$