

Physics I: Mechanics

Problem 1: (30 pts.) An absent-minded physics professor takes a walk prior to class. He starts at the Hugel Science Center and walks at 30° north of east at 0.7 m/s for 10 minutes. He next heads 70° south of east at 0.4 m/s for 15 minutes. He then looks at his watch and realizes he has 5 minutes to get back to the Hugel Science Center for class. What average velocity vector (magnitude and direction) must he have in order to just make it to class on time?

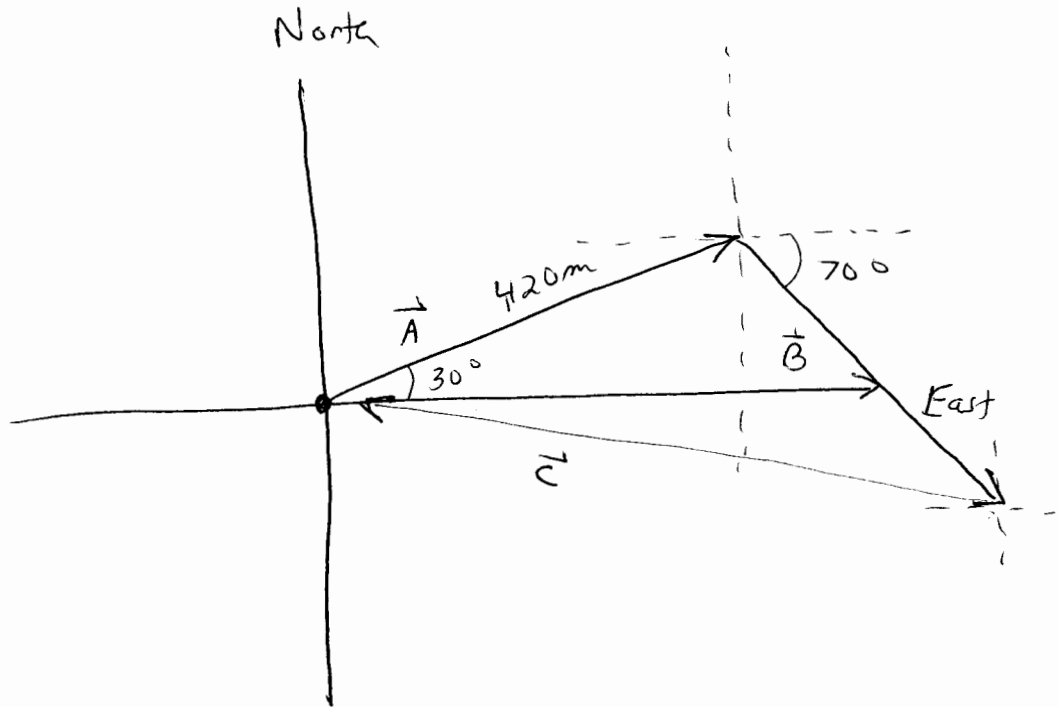
Physics 131-01 (8 am)
February 16, 2007
Test 1

Name: _____

If any question is unclear, *please* ask immediately. Be sure to show your work **clearly** and **draw a box around your answer**. Partial credit may be given for work if it can be understood.

If you get stuck on the **math** at any point, be sure to indicate clearly the **physics** you are using and how you would continue if you could do the math.

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$$\vec{A} = 30^\circ, 0.7 \text{ m/s} \times 10 \text{ min} \times 60 \text{ min/hr} = 420 \text{ m} @ 30^\circ = (364 \text{ m}, 210 \text{ m})$$

$$\vec{B} = -70^\circ, 0.4 \text{ m/s} \times 15 \text{ min} \times 60 \text{ min/hr} = 360 \text{ m} @ -70^\circ = (123 \text{ m}, -338 \text{ m})$$

$$\text{Want } \vec{A} + \vec{B} + \vec{C} = 0, \Rightarrow \vec{C} = -\vec{A} - \vec{B}$$

$$\left. \begin{aligned} C_x &= -A_x - B_x = -487 \text{ m} \\ C_y &= -A_y - B_y = +128 \text{ m} \end{aligned} \right\} \vec{C} = 504 \text{ m} @ 165^\circ$$

$$\text{Speed} = \frac{504 \text{ m}}{300 \text{ s}} = \boxed{1.68 \text{ m/s}} \quad \text{direction: } \boxed{165^\circ \text{ from East.}}$$