Homework 1

SABIC: Physics

Due January 21, 2016

Reading (Due April 1, 2015):

Read Chapter 1.

Problem 1: practice with estimation

(a) How many kernels of corn does it take to fill a 2 liter soda bottle?

(b) How many liters of gasoline are used in the United States in one day?

Problem 2: conceptual

(a) What physical phenomena could you use to define a time standard?

(b) Describe how you could measure the thickness of a sheet of paper with an ordinary ruler.

(c) Can you find two vectors with different lengths that have a vector sum of zero? What length restrictions are required for three vectors to have a vector sum of zero? Explain your reasoning.

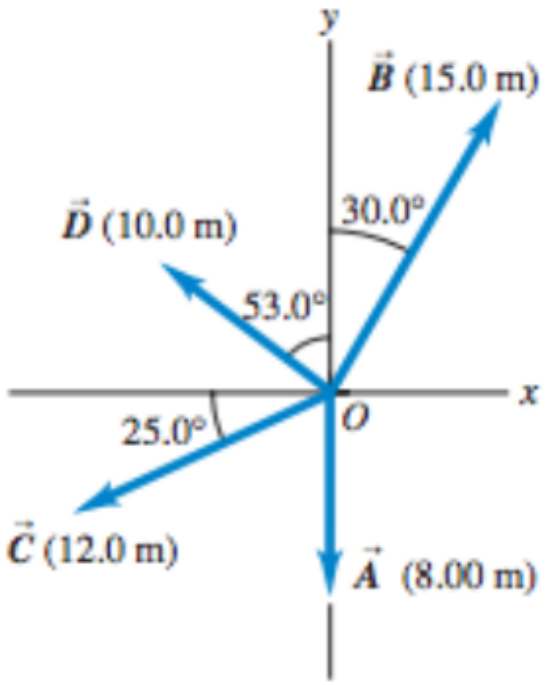
(d) (i) Does it make sense to say that a vector is negative? Why? (ii) Does it make sense to say that one vector is the negative of another? Why? Does your answer here contradict what you said in part (i)?

(e)

Problem 3: vector addition

(a) For the vectors $\vec{A}$ and $\vec{B}$in the figure, find the magnitude and direction of (i) $\vec{A} + \vec{B}$, (ii) $\vec{A} - \vec{B}$, (iii) $-\vec{A} - \vec{B}$, and (iv) $\vec{B} - \vec{A}$.

(b) A spelunker is surveying a cave. She follows a passage 180 m straight west, then 210 m in a direction 45° east of south, and then 280 m at 30° east of north. After a fourth unmeasured displacement, she finds herself back where she started. Use a scale drawing to determine the magnitude and direction of the fourth displacement.



Problem 4: vector multiplication

(a) For the vectors $\vec{A}$, $\vec{B}$, and $\vec{C}$ in the figure, find $\vec{A} \cdot \vec{B}$, $\vec{A} \cdot \vec{C}$, and $\vec{B} \cdot \vec{C}$.

(b) For the vectors $\vec{A}$ and $\vec{D}$ in the figure, find the magnitude and direction of $\vec{A} \times \vec{D}$ and $\vec{D} \times \vec{A}$.