Assignment II, PHYS 111 (General Physics I)
Fall 2016
Due 9/2/16 at start of class

As always, please legibly write (or type) your answers on separate paper.

To help with this homework, you should have read chapter 1 of your text and watched the videos associated with the lectures for August 24th and August 26th on the course webpage: http://larsenml.people.cofc.edu/phys111_fall16.html.

1. A right circular cylindrical container (e.g. a tube) is measured to have a *diameter* of 2.5 inches and a height of 18 inches. What is its volume *in cubic centimeters*? (1 cubic centimeter, also sometimes called a cc for short, is a volume that is 1 cm x 1 cm x 1 cm).

2. What is the area of the surface of the Earth in square nanometers? (You may assume the Earth is a sphere. You may need to refresh your memory to find the surface area of a sphere. The radius of the Earth is near the front cover of your text).

3. A lawnmower cuts a swath that is 22 inches across. You can push the mower at 3.5 miles per hour. What is the minimum amount of time it could take to mow a 2.3 acre yard with this push mower? (Assume you are perfect with the mower, never slow down, and the dimensions work out right so that you are always cutting the maximum amount of grass).

4. The statue of liberty has an approximate mass of about 200000 kg.

   a) The approximate mass of a penny is 2.5 grams. How much money would you have if you had the mass of the statue of liberty in pennies?

   b) The approximate mass of a quarter is 5.670 grams. How much money would you have if you had the mass of the statue of liberty in quarters?

   c) The hope diamond is worth approximately 250 million dollars. The approximate mass of a dollar coin is 8.100 grams. If you had the statue of liberty's mass in dollar coins, could you afford to buy the hope diamond at is appraised value? (Justify your answer with a computation).

5. Define the following vectors (for use in this problem and the next one):

$$\vec{A} = (3.2 \text{ m})\,\hat{i} + (0.4 \text{ m})\,\hat{j}$$
$$|\vec{B}| = 7.2 \text{ m} \qquad \theta_B = 18^\circ$$
$$|\vec{C}| = 13.3 \text{ m} \qquad \theta_C = 123^\circ$$
$$|\vec{D}| = 8.7 \text{ m} \qquad \theta_D = -15^\circ$$
$$\vec{E} = (11.1 \text{ m})\,\hat{i} - (4.1 \text{ m})\,\hat{j}$$
$$\vec{F} = -(3.4 \text{ m})\,\hat{j}$$

Angles are measured as done in class; (starting from the x axis, in such a way that the positive y axis is 90°). Calculate the following. For each, leave your answer in both of the following forms: (i) Component form (like vectors $\vec{A}, \vec{E}$, and $\vec{F}$ above), and (ii) magnitude and direction form (like vectors $\vec{B}, \vec{C}$, and $\vec{D}$ above).

a) $\vec{A} + \vec{B}$

b) $\vec{B} - \vec{C}$

c) $\vec{C} + \vec{D} - \vec{E}$

d) $\left(\vec{B} + \vec{C}\right) - \left(\vec{E} + \vec{F}\right)$

6. Find a vector $\vec{M}$ that satisfies the following: $\vec{A} + \vec{B} - 2\vec{C} + 3\vec{M} = 0$.

7. Find the following. Clearly indicate if your answer for each is a vector or a scalar. You may leave vector answers in either component or magnitude-and-direction form.

a) $\vec{A} \cdot \vec{E}$

b) $\vec{E} \cdot \vec{F}$

c) $\vec{E} \cdot \vec{E}$

d) $\vec{A} \times \vec{E}$

e) $\vec{E} \times \vec{F}$

f) $\vec{F} \times \vec{F}$