Assignment II, PHYS 111 (General Physics I)
Fall 2021
Due 9/2/21 at start of class

In each homework assignment, I will list suggested homework problems out of the book. These are worth practicing – some may even appear on exams verbatim – but since they are in the text, finding answers on-line should be straightforward and these textbook problems will not be graded. I suggest you do them – many of them will be easier than the graded homework and they would be a good thing to tackle in your SI sessions to get comfortable with the content.

After the suggested book problems, I will give a list of problems that I myself wrote. *SOME* of these problems will be graded, but you won't know which ahead of time. The ones that I grade will be the same for everyone in the class.

I will supply you with an answer key to all of the problems that I wrote – even the ones that I did not grade.

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

To help with this homework, you should read the first sections of your text and watch the videos associated with the lectures on the course webpage: http://larsenml.people.cofc.edu/phys111_fall21.html.

(Ungraded) suggested textbook practice problems.

(All problems are odd problems (that have answers in the back of the book) out of Halliday, Resnick, and Walker, 10th Ed.)

Chapter 1:
Problems: 1, 7, 13, 15, 23, 37, 41, 49, 55

Chapter 3:
Questions: 1, 7, 13
Problems: 3, 7, 9, 15, 21, 23, 27, 33, 35, 39, 41, 53, 57, 69, 75

Graded homework problems

As stated above, some subset of the problems below will be graded for accuracy. Unless you are a gambler, I recommend completing all of them.

1. A right circular cylindrical container (e.g. a tube) is measured to have a *diameter* of 3.5 inches and a height of 21 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 easy to Google.)

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 its appraised value? (Justify your answer with a computation).

Define the following vectors (for use in the rest of this assignment):

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

Angles are measured as done in class; (starting from the x axis, in such a way that the positive y axis is 90°).

5. 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. If $\vec{A} \cdot \vec{G} = 17.0 \text{ m}^2$ and $\vec{E} \cdot \vec{G} = -10.0 \text{ m}^2$, then what is $\vec{G}$? (Leave your answer in magnitude and direction form).

8. Compute the following.

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

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

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