Weekly Journal 7

Introduction

In your Weekly Journals, you will reflect on various aspects of the work you are doing, and how things are going overall. The goal of these Weekly Journals is to encourage you to take an active role in your own learning: you'll be prompted to consider what you are doing and how it is and isn't working. The Weekly Journals will be graded based on whether you have put a good-faith effort in. If you do not have time to attempt a portion of the work needed to do a journal, you should just say so: you will not lose credit. Please do not make things up, pretend to have completed work you have not done, or copy work from outside sources: this just wastes everyone's time. This is my first time using the Weekly Journals, so it is likely that they will evolve as I discover what is working and what isn't. It is my hope that these journals will help you develop more effective, efficient, and interesting ways of learning physics!

Completing a Weekly Journal

Each Weekly Journal will be submitted as a pdf file via Gradescope, accessed via the Weekly Journal Canvas assignment. In Gradescope, you will be presented with a pdf file (like this one!) with a series of questions. Some of the questions will be related to tasks you have been doing for class such as reading, lecture viewing, and Mastering Physics homework. You should answer these questions either on paper or in an electronic document.

The pdf file will also contain a sample test question or questions, to be attempted after all the other work is done. You should attempt the sample test question(s) in a test-like environment: do not consult the textbook or other outside resources. However, you should feel free to consult the course equation sheet for needed equations.

After you have completed the sample test question(s), download the solutions so you can evaluate your work, and answer the questions as you are prompted to do so.

Once you have answered all the questions, convert your answers, including a picture of your sample test answer, to pdf files. Finally, combine your pdf files for the Weekly Journal questions and the sample test question(s) (there are many apps that can do this) and submit your work to Gradescope.

Work for this Weekly Journal

This Weekly Journal focuses specifically on using integrals to calculate the moment of inertia of various objects. Prior to doing the Weekly Journal, please complete the following:

- Watch lecture 4.3 on Moment of Inertia
- Read 9.6 in the book.
- Attempt each of the moment of inertia Classkick (available in Files/Jamboard) problems, and use the solutions to check your work. Be sure to get to know the steps for this type of problem, as laid out in the Problem Solving Guide.

Preliminary Questions

1. Which of the steps, as laid out in the problem solving guide for moment of inertia integrals, confuses you the most? Give an example from the lecture, Classkick, or reading where you didn't fully understand this step.

Sample Test Problem

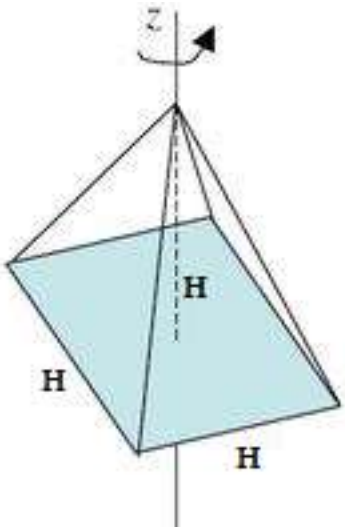
Once you have completed the other work for the week, in a test-like setting, attempt to answer the questions below. This is intended as practice for the actual test- so prepare for it as you might for the actual test! You may use the course equation sheet as you complete the problem. Unlike a real test though, there will be no time pressure: take your time to create complete solutions with diagrams, neatly organized work, and explanations: your goal should be something like you see in the book example problems. Do NOT look at the solution ahead of time: remember, you will be graded on the quality of your reflection, not on the correctness of your work.

Problem:

You know (using an equation derived in the Classkick) that the moment of inertia of a square sheet of mass M with sides of length L about an axis through the sheet's center and perpendicular to its plane is given by

$$I = \frac{1}{6}ML^2$$

Use this fact to find an expression for the moment of inertia of square-based pyramid with uniform density ρ, height H, and sides of length H, rotating about an axis that passes through the center of its base and the tip of the pyramid, as shown to the right. Your answer should be in terms of H and ρ.



Sample Test Problem Review

Once you have completed the sample test problem, download the solution from Files/Weekly Journal, and answer the questions below. (Note that the solution uses a slightly different phrasing of the problem, where the equation given is for that of a cube: but the solution itself is the same). If you didn't get far enough in your solution to answer one of the questions below, just say so.

For each question below, if the answer is "no", explain briefly why you might have made a mistake/missed this step. If you make a mistake in an early stage in the problem, for the later parts, assess whether your method was correct, rather than whether you got the correct answer.

2.

2.1. When you upload your work to GradeScope, indicate the page(s) in your document where you completed this problem.
2.2. Did you draw a differential element on your diagram?
2.3. Did you introduce a parameterizing variable? If so, what was it?
2.4. Were you able to write the correct expresson for dI?
2.5. Were you able to integrate to find the correct answer?