Inventing Reality: Week #7 Handout, 2004.03.08
by Douglas Leonard

Announcements

• Next week is Spring Break, so there is no class!
• So that you can focus your energy on the book review that is due on March 24, you do not need to hand in a written weekly assignment on Monday, March 22 – no thought question, no synopsis, no reflection. You will still be given a thought question to think about (see below), but you do not need to write out and turn in your response. The next weekly assignment will be due Monday March 29 – it should include a synopsis for the last two class weeks, but only one Thought Question and one reflective piece.

Assignment for Wednesday, March 10

• Turn in the index card given to you on Monday stating the name of the book that you are choosing to review for the book review (book review due Wednesday, March 24), and a brief statement giving your idea for your final project. Briefly outline the nature and format that you envision your project taking, and don’t worry, your topic idea is not written in stone at this point, just on an index card.
• Answer the following questions from your Reader, being sure to circle and put labels on all final numerical answers.

1. p. 110, Question 6.

2. p. 111, Problem 12. Note that this planet is assumed to be orbiting the Sun.

3. p. 111, Problem 16. This one is a bit challenging, and will be a good test of your mathematical skills, so here are some hints. Start by very clearly defining the variables that you are going to need, \( P_1, P_2 \) for the periods of the two moons’ orbits about Jupiter, and \( R_1, R_2 \) for the distances of the 2 moons from Jupiter’s center. From the given information, we know that \( P_1 = 5.196 P_2 \). Now, Kepler’s 3rd Law must apply to both moons in the system, so the constant \( k \) must be equal to \( P_1^2 / R_1^3 \) as well as to \( P_2^2 / R_2^3 \). And from Euclid’s axioms, things that are equal to the same thing are equal to each other. OK, from here, now, use your mathematical might to show that the ratio \( R_1 / R_2 \) must be equal to 3. Carefully show all of your steps. Along the way, it will be helpful to know that \( 5.196^2 = 27 \). Really try to solve this one – you can do it!

Assignment for Monday, March 22

• Reader: p. 60 – 62. Isaac Newton, from The Trinity Notebooks.

While a student in Trinity college at Cambridge, the young Isaac Newton kept a small notebook in which he wrote down questions he was pondering. Here, I’ve excerpted some of his musings on mathematics, atoms, philosophy, God, and the curious results he obtained by pressing a finger into his eye.

• Reader: p. 63 – 64. Isaac Newton, from The Principia, “Rules of Reasoning in Philosophy”.

This is the introductory material of Newton’s masterwork. Read carefully the rules that he feels govern all philosophical inquiries, and think about the similarities and differences between Newton’s approach with that of the “giants” upon whose shoulders he stood.

• Reader: p. 113 – 115. The Continuity of Mechanics and A Conversation with Isaac Newton, by Fred Alan Wolf, from Taking the Quantum Leap.

Continue reading here about Isaac Newton’s great machine, the mechanistic universe as conceived by Descartes, and the first inklings of determinism.


This is the first of several reading passages from Paul Hewitt’s wonderful text, in which the great laws of physics are elegantly described conceptually, with only a minimum of mathematics. (For those of you who have had some physics, much of this may be review.) In this chapter, pay particular attention to the
careful definitions of the terms acceleration, speed, and velocity, and be sure you understand the answers to the sample questions that are given.

  Having already read the first part of this chapter a couple weeks ago, continue here and read about Newton’s statement of Galileo’s Law of Inertia, the subtle difference between mass and weight, and the principle of relative motion. (Note that the bottom line of p. 142 is cutoff from both the figure caption and the Answers to the sample questions. The missing words from the caption of Fig. 3-6 is: “...will continue without change”; the missing line from the answer to question 2 is: “.. is not.”

  This section discusses that crucial equation that explains it all, \( F = ma \). Be sure to pay close attention!

**Weekly Thought Question**

Think about, and come prepared to discuss, the following thought question for the Monday after Spring break. You do not need to write out your response.

As you read Isaac Newton’s “Rules of Reasoning in Philosophy” (p. 63 & 64 in the Reader), ask yourself: What do you think is the single biggest difference between how Newton sought answers about the physical world and how Aristotle did?

**Assignment for Wednesday, March 24**

**Homework Problems**

Answer the following questions from your Reader, being sure to circle final answers, and put labels on any numerical answers. These problems are due on Wednesday, March 24, at the start of class.
- Reader, p. 136, “Think and Explain” questions 2, 3, 5, and 6. Please explain your answers carefully.
- Reader, p. 158, “Review Question” number 16.
- Reader, p. 159, “Think and Explain” questions 3 and 5.

→ Reminder – **Book review due** on Wednesday, March 24. Please turn in at the start of class! Remember, to get an idea what type of report to shoot for, we have placed on reserve at the Library Center sample reviews from former students that were judged to be particularly good. You will see that they vary quite a lot in content and form from one another.