Astronomy 1 fall 2009
Prof: R Antonucci Office: Broida 2015K

Assignment # 3
Due Friday October 16, 2009

Instructions

On this and future assignments, please write your name on all pages and staple all pages together. Write very clearly!

Please be sure to explain your answer to all word problems briefly but carefully, and to show all your work on the calculations. The grade on each problem will reflect more the verbal explanations and the calculations shown rather than the final answers given in the back. (In fact, the answers to most of the quantitative questions from the book are given in the back and I'll give you the answers to most of my quantitative questions right on the assignments).

You may work with others on the homework problems, but you must write them up yourself, using your own words and calculations. If you hand in a paper nearly identical to someone else's, neither of you will get any credit because we won't know whether or not you actually did the work.

Also, the solutions will be shown on our class website very soon after the due date: http://www.ucsb.physics.edu/~astro1/fall2009 . Partly for this reason, we **cannot accept late homework! (Only exception: if you have an emergency and tell me before the due date).**

Lastly, we will have to pick three problems to grade in detail and each will be worth 10 points. For the other problems we will just check briefly, and assign 5 points if you've made a reasonable attempt.

SHOW ALL WORK

1. Ch 4, # 9, 12, 14, 15

2. Ch 4, #19 (Note: this requires a creative approximation)

3. Ch 4, #21, 22, 23, 24

4. Ch 4, # 27 (Note: a trick question!), #30

5. Gravity on Earth causes objects to fall with an acceleration of 9.8 meters per second per second, or 9.8 m/sec^2 for short. On Mars the acceleration of gravity is 0.38 times as large.

   a. What is the weight of a 10-kilogram brick on the Earth? The weight of a body is equal to the force of gravity acting on a body and is measured in Newtons.

   b. What is the weight of a 10-kilogram brick on Mars? What is the mass of this

brick?

c. A nasty person drops a 10-kilogram brick onto your foot from a height of 3 meters. Will this hurt more, less, or the same if the person does this to you on Mars instead of Earth?

d. Another nasty person throws a 10-kilogram brick at you so that it hits you moving horizontally at a speed of 2 m/sec. Will this hurt more, less, or the same if the person does this to you on Mars as opposed to on Earth?

6. For the following problems, even though we give the results, the point is to show your work and describe the method you used to get the answer. If you get a different answer, argue why you think yours is right.

a. Estimate the gravitational force between you and the person who sits next to you in class. Express your answer in Newtons and in pounds. (Something like 3×10^{-7} N, or 6×10^{-8} pounds.)

b. What is the gravitational force between you and the Earth? (Something like 600 N.)

c. What would you weigh on Mars' moon Deimos? This will require some information from the appendix as well as some creative approximation. (Something like 0.2 N, or 0.04 lbs, or about an ounce.)

7. Go out early some evening and look high in the western sky - there is a very bright "star." Measure its altitude above the horizon by using your fist as a protractor. Recall that you fist subtends (covers) and angle of about 10 degrees when you stretch out your arm. Write down the altitude of the object, and the exact time of day and day of the week of your observation. Can you figure out what this object is? (We'll see it with our telescopes on observations night.) You can do this with the Starry Night program, or by surfing around.