Astronomy 162 – Winter Quarter 2006
Homework #3

Due in class Monday, February 13

Instructions

This handout is just a worksheet: homework answers must be turned in on the bubble sheets provided. You can pickup additional bubble sheets during class.

Use a #2 pencil only (no pens), and please fill in the following info:

1. Your full name, **last name** first, first name last, and remember to bubble in the letters.
2. Bubble in the 5-digit homework code, **14841,** on the form under "Identification Number" in columns A-E (lower left-hand corner of the form). Do **not** enter your Student ID or any other info into this area, just the 5-digit homework code.
3. Bubble in your answers under questions 1-5 in the fields provided on the form.

Please turn in your homework in person during class on Monday, February 13.
No late homework will be accepted.

This homework assignment consists of the 5 questions below. Each question has equal weight.

1. You estimate the luminosity distance to a star in our Galaxy, but decide to ignore the fact that there is strong evidence that between us and the star there is a large, dense cloud of dust and gas. What will happen to your estimate of this star's distance as a result?

   a) It will have no effect on the luminosity distance I estimate.
   b) I will overestimate the true distance to the star.
   c) I won't be able to measure the distance to this star at all.
   d) I will underestimate the true distance to the star.

2. The Sun is on a roughly circular orbit around the Galactic Center with a radius of about 8000 parsecs and with an orbital speed of about 200 km/second. Using the fact that 1 parsec is 3.086×10^{13} km, and 1 year lasts about 365.25 days, how many **years** does it take for the Sun to complete 1 orbit around our Galaxy [pick the closet answer from below]?

   a) 240 Million years
   b) 2.4 Billion years
   c) 24 Million years
   d) 2.4 Million years
   [Hint: you need to compute the circumference of the Sun's orbit]

3. The Earth is 1 AU from the Sun ($M=1M_{sun}$) and has an orbital speed of about 30 km/sec. If a star were located 1 AU from a 1 Million M_{sun} Black Hole, how fast would its orbital speed be? [Hint: check out Lecture 4 from the first week on Matter & Gravity]

   a) 30 km/sec
   b) 30,000 km/sec
   c) 30,000,000 km/sec
   d) 3,000 km/sec

4. A Cepheid variable star is 50 kpc (kiloparsecs) away and has a pulsation period of 10 days. You observe a second Cepheid variable in a distant galaxy with the same 10-day pulsation period, but now it appears to be 10,000 times fainter than the first Cepheid. What is the distance of this galaxy?

   a) 500 kpc
   b) 5000 kpc
   c) 50,000 kpc
   d) 500,000 kpc

5. You observe a faint, nearby red star that has a very large proper motion in a direction that is roughly perpendicular to the plane of the Milky Way. A spectrum of this star shows that it is a very metal-poor red dwarf star. From this you conclude that

   a) The star is an old, cool Population I star.
   b) You have insufficient data to conclude anything about the star's population.
   c) The star is a young, cool Population I star.
   d) The star is an old, cool Population II star.