

Astronomy 16 Modern Astrophysics

Fall 2014

Homework 6

due: Wednesday, November 12, by 11 AM

It is very important to present your solutions neatly and clearly. Use units when appropriate, state where your numbers come from, explain what you're doing. Use sketches when you think they'd be useful. Make sure you answer all the parts of each problem, including my supplemental questions for some of the book problems.

1. Ryden & Peterson, problem 14.5 (p. 349). More even than most problems, this one requires you to write some words about what you're assuming/doing (e.g. what does distance have to do with putting stars on an HR diagram?).
2. Ryden & Peterson, problem 13.1 (p. 334).
3. Ryden & Peterson, problem 13.2 (f) (p. 334). Do only part (f). But then also answer this question about the star in part (f): how many times more luminous than the Sun is this star?
4. Ryden & Peterson, problem 13.4 (p. 334).
5. Ryden & Peterson, problem 13.6 (p. 335).
6. Ryden & Peterson, problem 13.7 (p. 335). You must give your answer in solar mass units (i.e. as a multiple of the Sun's mass). How might we know for a subset of binary systems that the inclination angle is close to 90 degrees? (I.e. what phenomenon might we observe for a given binary star system that would assure us that the inclination angle is at least close to 90 degrees?) How would your estimate of the masses change

(qualitatively) if the inclination were less than 90 degrees? (I.e. given the period and projected radial velocity maxima, would you find lower or higher masses for the stars if the inclination angle were less than 90 degrees?) What would the masses be (quantitatively) if the inclination had its most probable value? Why is the actual value likely to be larger than the formally most probable value of the distribution? *You must answer all parts of this question for full credit.*

7. Ryden & Peterson, problem 13.8 (p. 335).
8. Ryden & Peterson, problem 13.9 (p. 335).
9. Ryden & Peterson, problem 13.11 (p. 335). For full credit, you must directly address what effect the potentially different radii of the two stars has on your analysis. You should describe carefully what portions of each stars' surface are not visible during each of the eclipses, and compare the relative sizes of these two eclipsed areas.
10. Ryden & Peterson, problem 17.3 (p. 407).
11. Ryden & Peterson, problem 17.4 (pp. 407-08). Explain why this helium-burning, horizontal branch lifetime is a lot shorter than the star's main sequence lifetime.