ASTR 2320 General Astronomy II – Spring 2019, Brotherton

Homework #4, due in class Monday March 4, 2019

Instructions: Homework write-ups should be clean and clear. Illegible or hard to understand solutions may not earn credit. In addition to the solution, the steps leading to the solution are also important to earn full credit. You may need to use information from the internet to solve some of the problems (e.g. Simbad, etc.), and you should clearly state your sources if you do so. Use appropriate units and significant figures for your solutions (or uncertainties if requested). It is permissible to work in groups, but everyone must hand in their own solutions that they have written themselves.

1. Stellar size with colors and luminosities. State your sources for your information.

a) What is the effective temperature of Betelgeuse in Kelvin?

b) What is the absolute bolometric magnitude of Betelgeuse? Equivalently, what is the bolometric luminosity in solar units?

c) Using the above two answers, along with what you know about the sun (i.e. temperature and bolometric luminosity), what is the radius of Betelguese in solar radii? Show the math. Compare your answer to the answer in Wikipedia.

d) What is this radius in astronomical units? What planets in our solar system would be within that radius, if Betelguese were to replace the sun?

2. NASA ADS. Use google to get there the way the pros do. ;)

a) How many papers has your professor, as lead author or a co-author, published overall? How many if restricted to refereed journals only?

b) How many citations does your professor have in total? Which paper has the most citations?

c) What are the RA and Dec coordinates of the "spectacular post-starburst quasar" your professor published in 1999? What is the reference to that paper that you would list in a paper if you cited it?

d) The color-magnitude diagram for M15 shown in Chapter 14 of the textbook is by Durrell & Harris (1993). Which figure from that paper is used in the textbook? What is the distance modulus and distance (in kpc) of M15 reported in that paper?

3. An H-R Diagram for the Hyades Open Cluster.

Make a plot of luminosity vs. temperature (in reverse on X-axis) for the Hyades. Log quantities are ok, and likely necessary for luminosity at least. Compare your plot to the textbook Figure 14.6a: Pleiades CMD. From Johnson & Mitchell 1958, ApJ 128, 31. The quantities plotted will be different, but there should be similarities.

Hint: Find a paper that tabulates these properties for the Hyades. de Bruijne et al. (2001) is such a paper. Additionally, the "D" link on NASA ADS will take you to online data accessible via VizieR, a tool for accessing data tables in papers. It will also let you make some simple plots from the data and save it as a png file, which you can print.

4. Reading carefully? Explain / define
a) effective temperature
b) opacity
c) equivalent width
d) ionization energy
e) metallicity
f) brown dwarf