ASTR 302

Homework 4: Due April 5, 2024

You are welcome to use any resources available to you, and are free to discuss the homework with other students. Collaborative studying is encouraged, but the write-up you turn in should be your own. Please neatly write or type your results, showing your work and/or justifying your answers with equations (i.e. don't just use your computer to calculate the answer and then only give the result).

1. Work through the python notebook named 'Astr302_HW4.1_Fitting.ipynb' and solve the question at the end about CCD linearity.

2. Use the least-squares method to calculate the transformation coefficients for the V-R and R-I data in Birney Table 10.1

3. Looking at the light curve of the planet transit in Birney Figure 10.7, calculate the approximate size of the planet relative to the star.

4. The Calcium Infrared Triple lines are a prominent feature of stellar spectra, consisting of three deep atomic lines around 8500 Angstroms. They have central wavelengths of 8498.018 Angstroms, 8542.089 Angstroms, and 8662.14 Angstroms.

    a. What spectral resolution do you need to resolve these features? Describe the characteristics of a spectrograph that provides this resolution.
    b. Repeat the analysis for the Sodium Doublet (5895.92, 5889.95 Angstroms). How would you modify the spectrograph to resolve these features?

5. Peruse the Richardson Grating Laboratory catalog (gratinglab.com). Find an R4 echelle grating. Read the spec sheet for it and describe the properties of the grating (include figures if helpful). What master ruling does this grating use?