Astronomy 211T **Fall 2017**

Problems for Tutorial Week #6
Spectra

Based on questions from E. Jensen (Swarthmore)

1. *What is the role of each of the following elements of a spectrograph?* Telescope, slit, collimator, disperser (grating or prism), camera, and detector. Roughly diagram the path of two different wavelengths of light through the spectrograph, showing how the light passes through each element of the spectrograph. Note that the use of the word "camera" here is distinct from how we've used it before; we sometimes refer to a "CCD camera," but here that's not what it means.

2. *Blazing*. What does it mean to blaze a grating? Why is it done?

3. *Spectral resolution or spectral purity*. How is it defined? What factors does it depend on? (It's not only the properties of the grating or prism, though those do matter.) In practice, how could you measure it? What is the equivalent of Nyquist sampling when we're talking about spectra rather than images?

4. *The slit*. If you took a spectrum of a star without using a slit in your spectrograph, what would that spectrum look like? (To help with seeing this, please sketch the resulting spectrum using colored pencils or pens.) What sets the spectral resolution of such a spectrum? Look on-line to find examples of slitless spectra of extended objects—Chandra has taken some of supernova remnants.

• Student 1 (alphabetical by 1st name) will describe the advantages and disadvantages of *integral field spectroscopy*.

• Student 2 will describe how the *Planetary Nebula Spectrograph* works.

• Student 3 will describe an *objective prism spectrograph* and the results it produces.