1. Fun with Systemic Console (radial velocity visualizer and data analysis). All links are available at sites.psu.edu/exo585/activities. Make sure to adjust the parameters by hand to get a sense for their effect on the signal and to produce an acceptable fit before using any of the automatic fitting functions.
   A. **Do this soon in case you run into technical difficulties:** Following the link on the Activities section of our course website, download and install the desktop version of the Systemic Console, version 1.5.12. Open Console.jar. If using a Mac, right-click and select Open.
   B. Follow Tutorial 1. In your problem set, include a plot of the data + model plot. List the parameters and chi-squared for this model. Also include a screen shot of the orbital view. Why doesn't clicking the 1-D minimization button next to each parameter one-by-one typically provide a good fit?
   C. Follow Tutorial 2. In your problem set, include a plot of the data + model plot. List the parameters and chi-squared for this model. Also include a screen shot of the orbital view. Also include plots folded to the orbital period of each planet, with each planet's own model overplotted (i.e., for the folded plot of planet b, turn off the other planets and only show the model for planet b, etc.).
   D. Follow Tutorial 3. In your problem set, include a plot of the data + model plot. List the parameters and chi-squared for this model. Also include a screen shot of the orbital view.

2. Exoplanet Transits & Occultations, SS 55
   A. Derive Equations 16 and 30
   B. Draw your own version of Fig. 6 for b=-0.5 and lambda = 90, 120, 150, 180
   C. What are two effects that star spots have on transit light curves?

3. Holman+ 2010
   A. What is the expected libration period of the 2:1 resonant angle stated in the paper from numerical simulations? To compare to the approximate resonant timescale we stated in class.
   B. Create a log scale orbital diagram of the system similar to the one you produced for other systems in Problem Set 1.
   C. What are the two pieces of evidence in the transit timing signal that planet b and c are gravitationally interacting?