Name:_____

Time series analysis: light curves

1. Open these three websites:
   https://colab.research.google.com/github/skgrunblatt/lightkurve/blob/main/docs/source/tutorials/3-science-examples/Identifying_a_transiting_planet_signal_in_Kepler_or_TESS_light_curves.ipynb

   https://colab.research.google.com/github/skgrunblatt/lightkurve/blob/main/docs/source/tutorials/3-science-examples/other_supernova_lightcurve.ipynb

   https://colab.research.google.com/github/skgrunblatt/lightkurve/blob/main/docs/source/tutorials/3-science-examples/How_to_Estimate_a_Stars_Mass_and_Radius_using_Asteroseismology.ipynb

2. (15 pts.) Run each one of these three tutorials, in order.

   In the first tutorial:
   What are the units of the x axis of the raw, uncorrected light curve?

   What about the y axis of the raw light curve?

   What is the period of planet b?

   What is its transit duration?

   What is the period of planet c?

   What is its transit duration?

   How would you find any additional transiting planets in this light curve? (2 pts.)

In the second tutorial:
What is the peak time of the supernova, in BKJD days?

In the third tutorial:
What are the units of the x and y axes of the periodogram? (2 pts.)

What are the values of numax and deltanu determined for this star? (2 pts.)

What are the corresponding values of stellar mass and radius? (2 pts.)

3. (20 pts.) Now run these tutorials, and answer the following questions.

https://colab.research.google.com/github/skgrunblatt/lightkurve/blob/main/docs/source/tutorials/3-science-examples/Identifying_a_transiting_planet_signal_in_Kepler_or_TESS_light_curves_K2-97.ipynb

https://colab.research.google.com/github/skgrunblatt/lightkurve/blob/main/docs/source/tutorials/3-science-examples/How_to_Estimate_a_Stars_Mass_and_Radius_using_Asteroseismology_K2-97.ipynb

What is the orbital period and transit duration of K2-97 b? (2 pts.)

What is the transit depth (the average dip in flux during transit)? (2 pts.)

What are the numax and deltanu values for this star? (2 pts.)

What are the stellar mass and stellar radius? (2 pts.)

Given the stellar radius and the transit depth, what is the planet radius in this system? What equation did you use to calculate the transit depth? (7 pts.)

Compare your planet radius estimate to what's reported in Table 2 of https://arxiv.org/pdf/1606.05818 . Does it agree within errors? Why/why not? (5 pts.)

4. (15 pts.) Now repeat this process for one of the targets in Table 1 of this paper: https://iopscience.iop.org/article/10.1088/0004-637X/767/2/127/pdf

   Save a plot of the periodogram of the stellar oscillations and the phase-folded transit light curve, and turn them in with this homework (10 pts.)

   Report the system name, final stellar mass, stellar radius, and planet radius that you measure (5 pts.)

   Do your values match what's listed in the NASA Exoplanet Archive?