Homework 1 - Basic Survey Observations

Don't forget to `svn up` *before you issue any other commands in SVN—this is to guard against you changing a document that someone else is working on in the same directory*[1].

Don't forget to `svn ci` *(with* `-m` *comments) frequently as you work. This allows others to see how your work progressed, and it automatically backs your work up as you produce it so that you're less likely to lose any of your work and/or so that you can revert to earlier versions of your work.*

Remember to comment your code carefully with your initials before every comment (as in `; ADM I just wrote a Python comment`*). Remember to provide an informative header for* **every** *function that you write. Also provide a README file to inform people how to run your code.*

1. Write a Python function that plots the positions (i.e. longitude against latitude) of the first five non-Earth planets[2] at 7AM and 7PM *Mountain Standard Time* on January 1 for the years from 2017 to 2027 *in ecliptic coordinates*. Procedures we have discussed in class such as `astropy.time` and `astropy.coords` can provide coordinates for the planets on a specific Julian Date[3]. You can use `import matplotlib.pyplot as plt` (etc.) to produce plots.

2. Write a Python function that plots the positions of the first five non-Earth planets at 7AM and 7PM *Mountain Standard Time* on January 1 for the years 2017 to 2027 *in equatorial coordinates*. Your procedure should also print out the time of day and the year of the lowest airmass observation for each planet, as observed from Kitt Peak National Observatory (KPNO) and still restricting to 2017 to 2027, January 1, 7AM or 7PM. On your plot, indicate these lowest airmass observations for each planet. The function `EarthLocation.of_site` in `astropy.coordinates` has hard-coded coordinates for Kitt Peak[4].

In my `week2` directory in SVN, there is a list of quasars called *HW1quasarfile.dat*[5]. This is a list of 1,111 $g = 18$ ("18th magnitude") quasars that I've drawn from the Sloan Digital Sky Survey. Provided in the file are the coordinates of the quasars in base-60 ($hms.ss$ ∘ $'$ $''$) format.

3. Write a Python function that takes, as an input, a month of the current year, and prints out which of the 1,111 quasars can be observed at lowest airmass from KPNO at 11PM *Mountain Standard Time* on any night over the duration of that month.

4. Use `if __name__ == "__main__":` to tie all of the functions from parts [1–3] together into a single Python module that, when run at the UNIX command line, carries out each of the three functions in order.

[1] this shouldn't be a big deal unless we're working collaboratively, but you should get into the habit *now*

[2] Mercury, Venus, Mars, Jupiter, Saturn

[3] see, e.g., `http://docs.astropy.org/en/stable/coordinates/solarsystem.html`

[4] see `astropy.coordinates.EarthLocation.get_site_names()`

[5] In general, it is **not** a good idea to store large data files in SVN as it slows down updates for all users, but this particular data file is very small