Homework 1 - Basic Survey Observations

When preparing your homework submissions, don't forget to `git fetch, git status, git pull` *before you issue any other commands in Git – this is to guard against you changing a document that someone else is working on in the same directory*[1].

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

Remember to comment your code carefully with your initials before every comment (as in `# JCR I just wrote a Python comment to document a change.` *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.*

Homework

1. Write a Python function that plots the positions (i.e. latitude versus longitude) of the first five non-Earth planets[2] at 7AM and 7PM Mountain Standard Time on January 1 for the years from 2020 to 2030 in ecliptic coordinates. Procedures we have discussed in class such as `astropy.time` and `astropy.coordinates` 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 2020 to 2030 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 Apache Point Observatory and still restricting to 2020 to 2030, 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 APO[4].

In my `week3` directory in `Git`, 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 coordinates of the quasars in base-60 (*hms.ss* ∘ ′ ″) format.

3. Write a Python function that takes, as an input, a month of the year and prints out which of the 1,111 quasars can be observed at lowest airmass from APO 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 Git as it slows down updates for all users, but this particular data file is very small.