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.*

Don't forget to log in using **your** *personal username and password on the physics network. Remember to comment your code carefully with your initials beside every comment (as in* `; ADM an IDL comment`*). Remember to provide an informative header for* **every** *function and procedure that you write (see my IDL Primer linked from the syllabus for an example of such a header).*

Throughout this homework, try to make your plots look professional. As this will be a recurring theme throughout ASTR5160, you may wish to write (or find) an IDL procedure that can be called to initiate a set of parameters for professional-looking plots.

1. Write an IDL procedure that plots the positions (i.e. longitude against latitude) of the first five planets[2] at 7AM and 7PM *Mountain Standard Time* on January 1 for the years from 2011 to 2020 *in ecliptic coordinates*. The procedure `planet_coords` will give approximate coordinates for the planets on a specific Julian Date. The procedure `julday` will convert a calendar date to a Julian Date (*in UTC*).

2. Write an IDL procedure that plots the positions of the first five planets at 7AM and 7PM *Mountain Standard Time* on January 1 for the years 2011 to 2020 *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 2011 to 2020, January 1, 7AM or 7PM. On your plot, indicate these lowest airmass observations for each planet. The procedure `observatory` will provide the coordinates of KPNO.

In my `week2` directory in SVN, there is a list of quasars called *HW1quasarfile.dat*[3]. This is a list of 1,066 $i = 18$ ("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, or what I referred to occasionally in the class notes as "time format".

1. Write an IDL procedure that plots the positions of the quasars in Galactic coordinates. Write a second procedure that uses the idl command `histogram` to plot the distribution of Galactic *b* (i.e. Galactic latitude) for the quasars in bins of $5°$ (from $-90°$ to $90°$). Note that you can use `plot` with `psym=10` to obtain a true histogram look. Your code should print some comments to screen that discuss the resulting histogram (why might the peak or peaks be where they are? If there are gaps in the histogram, why might this be?).

2. Write an IDL procedure that takes, as an input, a month of the current year, and prints out which of the 1,066 quasars can be observed at lowest airmass from KPNO at 11PM *Mountain Standard Time* on any night over the duration of that month.

[1] this shouldn't be a big deal until you start to work on the team project, but you should get into the habit *now*

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

[3] 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