Directions: Complete the following exercises and upload it to Collab **before** you come to the observatory to compete Lab 2. You can upload airmass charts and finder charts as separate attachments. Please bring a copy of the observing instructions as well as your pre-lab to the telescope when you observe. If you have any questions feel free to contact either Nick or Andrew.

1) Understanding Limiting Magnitudes
   a) What is the difference in magnitudes of two stars with fluxes $f_1$ and $f_2$?

   b) What is relation between limiting magnitude, $M_L$, and objective diameter, $d$?

   c) Estimate the limiting (V) magnitude of
      i) The human eye (dark adapted diameter ~ 7 mm)
      ii) The 6" Telescope
      iii) The 26" Telescope

2) Diffraction Patterns, Resolution and the Rayleigh Criterion
   a) What is the Rayleigh criterion?

   b) What are the physical (in AU or other reasonable units) and angular separations (in arcseconds) of the main binary components\(^1\) of
      i) Xi UMa?
      ii) Castor?

   c) Based on your answer above, what are the minimum telescope aperture diameters needed to resolve each of the binaries?

\(^1\) Technically both of these stars are quadruple systems, but only consider the “original” binary components. For example, only find the separation of Xi UMa A & B
3) **Observing Preparation** - We will be going over this section (particularly part b) in detail in the evening lab sections this Tuesday and Wednesday.

a) Make an **airmass chart** for **M35, Xi UMa, Castor, & Sirius**. Submit a copy with your prelab for grading. As you saw in the first lab, this is essential for planning when to observe.

b) Using ds9 make a **finding chart for M35**.
   i) Get ds9 onto your computer or use one in the astronomy department. It can be found at [http://ds9.si.edu](http://ds9.si.edu)

   ii) Load an image of M35 from the SAO-DSS, which can done through ds9. With a ds9 window open, go to Analysis -> Image Servers -> SAO-DSS and find M35.

   iii) Find a range of stars from the brightest down to the limiting magnitude you found in 1cii in ~0.5 to 1 magnitude increments and label them with their apparent V-band magnitudes. Tables of this information can be overlayed on your image through Analysis -> Catalogs -> Databases (use Simbad).

   iv) Submit a copy of this labeled finding chart with your prelab for grading. This will be essential for the limiting magnitude section of your lab.