Astronomy 211T **Fall 2017**

Problems for Tutorial Week # 8
Extinction/AO

1. a) As you know, differential photometry avoids many of the tedious and challenging requirements of absolute photometry. Explain why differential photometry works (beyond the fact that all stars are measured using the same size aperture, thereby sampling the same fraction of the PSF – we know that part already). That is, how do observations made for differential photometry effectively eliminate some of the steps that are needed for absolute photometry.

   b) On the other hand (there's *always* another hand), describe the limitations of differential photometry; what can and can't we do with differential photometry measurements that we could do with absolute photometry measurements.

2. In class I told you that the value of the ratio of the extinction in V compared with the color excess, $A_V/E(B-V)$ is equal to 3. I lied. This ratio, **R**, of "total to selective extinction," is not a given constant – it is highly dependent on the type and size distribution of the particles responsible for the extinction. Do some research and find out the range of values for **R** along different lines of sight in our Galaxy and in other galaxies.

3. The visual extinction to the Galactic Center is roughly 25 magnitudes. How many magnitudes of extinction is this in the K filter? Comment on why we observe the Galactic Center in the IR, not the optical.

4. The Johnson I filter stands for "Infrared," and indeed it is beyond the range of light visible to the human eye. But in many ways observing in the I band is much more like optical observing than observing at other infrared wavelengths is. What might be a better (and more fundamental) definition of the beginning of the infrared waveband? (Think about how a typical optical CCD works.) *(from E. Jensen)*

5. What is meant by "tip-tilt correction"?

Write up and present to class:

First student in each group, alphabetically:
Find as many reasons as you can and explain them as to why AO is easier at longer wavelengths, i.e., in the IR as opposed to the optical.

Second student: *Explain laser guide stars and distinguish between the 2 main kinds.*

Third student: *Describe the Shack-Hartmann wavefront sensor.*