

ASTR 302

Homework 2: Due February 9, 2024

You are welcome to use any resources available to you, and are free to discuss the homework with other students. Collaborative studying is encouraged, but the write-up you turn in should be your own. Please neatly write or type your results, showing your work and/or justifying your answers with equations (i.e. don't just use your computer to calculate the answer and then only give the result).

- 1) You wish to resolve a binary star with a separation of 0.3 arcseconds with a filter centered at 12000 Angstroms. Ignoring the blurring effects of the atmosphere, what is the minimum size telescope needed to resolve the binary?
- 2) The Luhman 16 binary is one of the closest stellar systems to the Sun. Its J2000 coordinates are RA = 10:49:18.9 and Dec. = -53:19:10.1. Luhman 16 has a proper motion of -2.759 arcsec / yr in RA and 0.354 arcsec / yr in declination. Accounting for the effects of both precession and proper motion, what are the coordinates of Luhman 16 at 12:00 UTC, Feb 28, 2024?
- 3) The Bok telescope has a 2.3m diameter $f/2.66$ primary mirror and a secondary used at a Cassegrain position that provides an effective focal length of $f/9$. The secondary mirror is 0.64 m in diameter.
 - a. What is the effective focal length of the telescope with the $f/9$ secondary?
 - b. Where is the secondary located relative to the primary mirror:
 - c. Where is the telescope focus located?
 - d. The primary imager for the Bok is the 90-prime camera, which sits at prime focus. 90-prime uses an array of 4 CCDs (2x2) with 4032x4096 pixels per CCD. The CCDs have 15 micron pixels. Calculate the plate scale in arcseconds / pixel, and the field of view of the imager (ignore extra space due to small gaps between the detectors).
- 4) The voltage across a resistor is determined as $V = I * R$. You measure the current to be $I = 2 \pm 0.15 \text{ Amps}$. The manufacturer of the resistor indicates it has resistance $R = 1.0 \pm 0.01 \text{ kilohms}$. Calculate the voltage; show your work.
- 5) You are taking a long observation of a star at high-airmass before it sets for the night. You are using an I-band filter with your CCD camera, but the guide camera on your telescope only has a V filter. What happens?