

UNIVERSITY OF KANSAS
Department of Physics and Astronomy
Physical Astronomy (ASTR 391) — Prof. Crossfield — Spring 2026

Problem Set –1

Due: Monday, April 20th at the start of class (0900 Kansas Time)

This problem set is worth 40 points.

As always, be sure to: show your work, circle your final answer, and use the appropriate number of significant figures.

1. [3 pts] At radio wavelengths, you observe something with an angular size of roughly 0.5 radians. Estimate its physical size, assuming it is located at a distance of roughly 100 pc.
2. [3 pts] At optical wavelengths, you observe something with an angular size of roughly 0.5 degrees. Estimate its physical size, assuming it is located at a distance of roughly 100 kpc.
3. [3 pts] At infrared wavelengths, you observe something with an angular size of roughly 0.5 arcsec. Estimate its physical size, assuming it is located at a distance of roughly 100 AU.
4. [3 pts] At closest approach, Jupiter is roughly 4 AU from Earth. Estimate the angular size of Jupiter then, in arcsec, assuming that planet is roughly 10 times larger than the Earth.
5. [3 pts] At its farthest, Jupiter is roughly 6 AU from Earth. Estimate the angular size of Jupiter then, in arcsec, assuming that planet is roughly 10 times larger than the Earth.
6. [3 pts] The galaxy Centaurus A is roughly 4 Mpc away and has a physical size of roughly 30 kpc. Estimate the angular size of Centaurus A, in arcsec.
7. [3 pts] The Crab Nebula has an angular size of roughly 5 arcmin and a physical diameter of roughly 3 pc. Estimate the distance to the Crab Nebula.
8. [3 pts] The orbit of star S0-2 has a semimajor axis of roughly 1000 AU, but on the sky the apparent (angular) size of the semimajor axis is just 1/8 arcsec. Estimate the distance to S0-2.
9. [3 pts] The Andromeda galaxy (M31) is roughly 40 kpc across, and has an angular size of roughly 3 degrees. Estimate the distance to Andromeda.
10. [5 pts] How do astronomers measure angular size? Sketch and label a (big, clear) diagram.
11. [5 pts] How do astronomers measure parallax? Sketch and label a (big, clear) diagram.
12. [3 pts] How many AU are in one parsec? How many arcsec are in one radian? How many degrees are in one radian?