Astr 350 Homework Set #1 – Due: Thursday, Sept. 8

Each problem is worth 10 points.

1. Assume you have 2 observers with telescopes which have a 5 arcmin field of view. At what distance should you place a point source such that the 2 observers, located on opposite sides of the Earth, will both just barely see the source in their telescopes when they both point at the same location on the celestial sphere? Express your answer in meters and AU.

2. Derive equation 1.1 in your textbook.

3. For a planet of mass m in orbit around a star of mass M with a period P, semimajor axis a, and an eccentricity e, what is the position averaged mean distance between the planet and star throughout a full orbit? How is the time averaged mean distance related to this (same, further, shorter and why)?

4. Assume an elliptical orbit with an arbitrary ω and $\gamma = 0$. Derive an expression for the radial velocity of the reduced mass in its orbit around M. Identify the terms which define the velocity semi-amplitude K, and write your expression in terms of K.

5. Problem 2.6 in your textbook.

6. Problem 2.8 in your textbook.

7. Problem 3.1 in your textbook.

8. Problem 3.9 in your textbook.

9. Problem 3.10 in your textbook.

10. Assume the Earth is a blackbody and the only source of energy it receives is radiant energy from the Sun. Calculate the equilibrium temperature of the Earth.

11. Calculate the maximum amount of stellar aberration possible and compare it to the parallax of the nearest star.