Ay 10 - Problem Set #1
Due: September 6, 11am

Please write your full name, section number, and GSI's name at the top of your homework. Also, be sure to put your homework in the correct box in the basement of Campbell Hall. There is a 20% penalty per day for the late submission of assignments, however you do get one "freebie" (see course syllabus for more info).

Remember to always show your work; no credit will be given for just a final answer. Use a calculator where necessary and don't forget units if the answer requires them.

If you use any resource (a web site, your text book, *etc.*), be sure to include proper attribution for the reference. Feel free to work with other students in the class, but remember that all work turned in must be your own (*i.e.* don't just copy the work of another student).

1. What is 1 AU in miles? Using this, figure out the speed of Earth around the Sun in miles per hour.

2. Calculate the rotational speed of Earth given that the radius of Earth is 6.378×10^6 m.

3. Using an Order of Magnitude estimation, approximate how many gallons of water you have drunk in your life.

4. Figure 1 depicts several stars as viewed by Jeff, your head GSI, through a roll of toilet paper. We know that the area viewed through that roll is about 0.5% of the total visible sky. Estimate about how many stars are visible to the naked eye on the whole sky.

5. The distance to Jupiter is about 5 AU and the distance from the Berkeley Hills to your bedroom is probably about 1 km. Also, the mass of Jupiter is 10^{15} times the mass of the Berkeley Hills.

   (a) Which exerts a stronger force on you?

   (b) By what order of magnitude is the force stronger?

   (c) Given your answer, what do you think about the traditional notion that the planets exert a strong influence on us?

6. We love old Nic Copernicus, don't get us wrong, but aside from "borrowing" heliocentric conceptions from ancient Sanskrit, the Qur'an, and medieval Indian astronomers, the model he proposed has real flaws and shortcomings. List a few of them (don't forget to cite any sources you use).

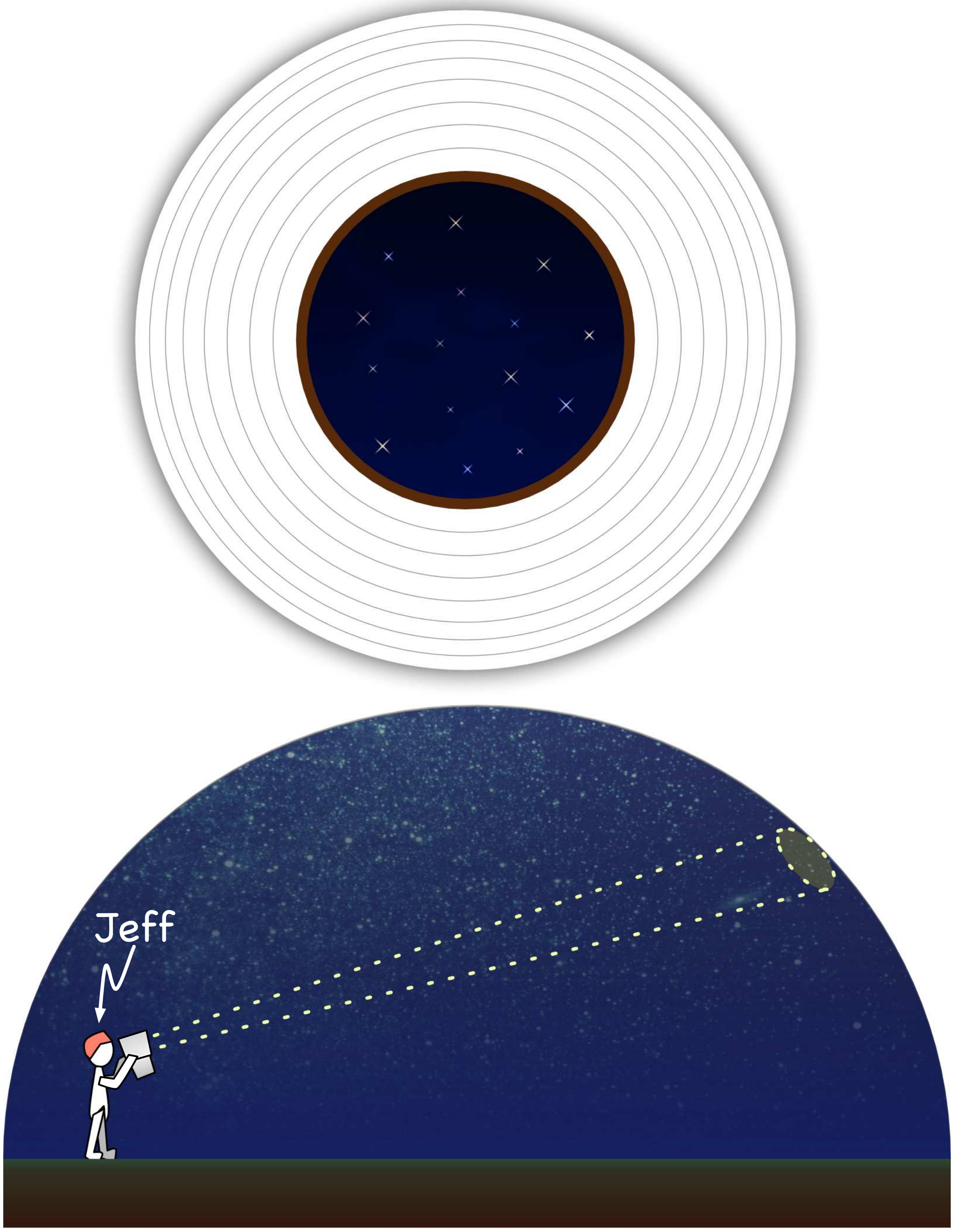

Figure 1: Jeff likes playing with toilet paper.

7. A “parcsec” is a unit of measure of distance that is a conjunction of the phrase “**par**allax of one arc**sec**ond”. A star with a parallax of 1 arcsecond (arcsec) is 1 parsec (pc) from the Sun. Due to the Earth’s motion around the Sun, all nearby objects will appear to shift on the sky with respect to the background stars.

   (a) Proxima Centauri has a parallax of 0.772 arcsec. What is its distance from the Sun in pc?

   (b) The Hubble Space Telescope can measure the positions of stars to about 1 milliarcsec accuracy. What is the furthest star that Hubble can measure its distance to using parallax?

   (c) What is the parallax of Pluto, a Solar System object formerly known as a planet? Why might its apparent motion on the sky over a year deviate somewhat from the normal “parallactic ellipse”?