

General Astronomy (29:61)
Fall 2012
Homework Set #1
Assigned: August 30, 2013
Due: September 6, 2013

Note: For some of the questions below, you will need to supply a missing piece of information or number to complete the problem. Think what this might be, and how you can find it. Feel free to talk to me if you are still stumped after thinking about it.

1. What is the current, approximate distance from the Earth to the planet Saturn? Figure out a way to determine this distance. There is more than one way to do it. You must describe your approach and show your work. It is not necessary to give a very precise number. One which is accurate at the 5 % - 10 % level is fine.
2. Using your answer to question # 1, what is the round-trip time that it would take a radio signal to travel from the Earth to a spacecraft orbiting Saturn, and then make the return trip?
3. An airplane flies over Iowa City, traveling from Denver en route to New York City. Describe the path in terms of the horizon coordinate system from the time an observer first sees it until he or she last sees it.
4. Here in Iowa, the *ecliptic* crosses the *meridian* at a maximum altitude angle of 72.1° and a minimum altitude angle of 24.9° . The *inclination* of the Moon's orbit to the plane of the ecliptic is 5.1° . What are the highest and lowest altitude angles that the Moon ever has at transit (here in Iowa)?
5. Use geometrical drawings and algebra to prove the following statement. To simplify things, consider an observer in the northern hemisphere. *The angle between the zenith and the North Celestial Pole is the complement of the latitude, \bar{l} .*
6. Using the result in the previous question, again use geometry and algebra to prove the statement made in class: *the altitude angle of any star at transit is $Al = \bar{l} + \delta$.*
7. Using the formula given in the previous problem (or given in class) calculate the declination of a star that just *barely* rises above the southern horizon here in Iowa City.

8. This question is for observations in Iowa City. What is the altitude angle of the bright star Arcturus (α Bootis, visible high in the western sky at nightfall) when it transits?