

**Observational Astronomy - Spring 2014**  
**Homework 5 - The Motion of the Earth and Moon**  
**Time, Precession, Eclipses, Tides**

1. You see the moon transiting at 6:00 PM. Approximately what phase is it in? On another day you see it transit at midnight. What phase is it in now?
2. The American Civil War began at Fort Sumter on April 12, 1861, and ended at Appomattox on May 10, 1865. Look up the Julian Day for each of these dates and calculate how many days the American Civil War lasted.
3. Why don't we have a solar eclipse every new moon when the moon is between the Earth and the Sun?
4. As we discussed in class, geosynchronous satellites orbit the Earth with a period of one sidereal day, and have orbits with an orbital radius of about 42,200 km. It turns out the the GPS satellites, which you probably use every day, orbit the Earth on what are called semi-synchronous orbits, which have an orbital period of  $1/2$  of a sidereal day. Using Kepler's third law, calculate the orbital radius of the GPS satellites.