Name: _____

Astr 1010 – Spring 2016

ASSIGNMENT #2 – DUE: MONDAY, FEBRUARY 22, 2016

1. Visit the Solar System simulator at http://space.jpl.nasa.gov/. Make two images for February 17, 2016, 0:00 UTC, with each body scaled to 30% of the image width:
   (1) Moon as viewed from Earth and (2) Earth as viewed from the Moon.
   Attach both images to your work.
   (a) What is the illumination phase of the Moon (cresent, gibbous, etc.)? _____
   (b) What is the illumination phase of Earth (cresent, gibbous, etc.)? _____
   (c) What is the angular size of the Moon (degrees)? _____
   (d) What is the angular size of the Earth (degrees)? _____
   (e) Make a sketch below of the Earth-Moon orientation with respect to incoming sunlight to explain the illumination appearance of both at this time.

2. Suppose it is 1:00 pm Eastern Standard Time on February 17. Fill in the time sat this instant (..., 9 am, 10 am, 11 am, ...) above all the time zones in the figure on the back of this page. Shade in the region of the new day, February 18.

3. Comet Hale-Bopp, which was visible in the spring of 1997, left the inner Solar System with an eccentricity of $e = 0.995$ and a semimajor axis of $a = 178$ AU. Find:
   (a) the orbital period $P = a^{3/2} =$ _____ years
   (b) the perihelion distance $= a(1 - e) =$ _____ AU
   (c) the aphelion distance $= a(1 + e) =$ _____ AU

4. Use Newton's form of Kepler's 3rd Law to find the mass of Jupiter using the orbit of Io:

$$(M + m)\ P^2 = a^3$$

   (a) period $P = 1.769$ days = _____ years (1 year = 365.24 days)
   (b) semimajor axis $a = 422{,}000$ km = _____ AU (1 AU $= 1.496 \times 10^8$ km)
   (c) mass of Io $m = 0$ (small)
   (d) mass of Jupiter $M =$ _____ solar masses = _____ Earth masses
   [Hint: 1 solar mass = 333,000 Earth masses]