SLAUGHT... errr, TEST
Feb 17, 2016

1. For an *approximate* determination of geographic latitude we think of the following experiment: we find a nearby tree and measure its diameter to be 120 cm. Then we move away from the tree due east (so that we see the tree in the westward direction) to a distance of 10 m and we focus on a star that *just* dips behind the tree. We start the stopwatch and measure the time it takes for said star to re-emerge from behind the tree, on the other side of the trunk, which happens to be 35.64 minutes. What is the geographic latitude of that location? Neglect any atmospheric effects.

2. We observe an unknown star tonight at 11pm local time from Villanova ($\varphi = 40°02'14''$ N, $\lambda = 75°20'57''$ W). We see it at $h = 72°38'44''$ and $A = 73°23'11''$. Use the almanac to read off the Greenwich sidereal time. You may neglect the atmospheric corrections in your answers.

   a) Determine the equatorial coordinates of the unknown star.
   b) At what local time will the star cross the local meridian next? Will that be a superior or inferior culmination?
   c) How long is that star above the horizon?

3. On what day in 2016 will it be ideal to observe Antares ($\alpha = 16^{\mathrm{h}}29^{\mathrm{m}}24^{\mathrm{s}}$, $\delta = -26°25'55''$) from the south pole at 10pm local time if we are facing precisely due south (i.e. Greenwich would be on the meridian behind you)? What will its altitude be then? Don't forget to take atmospheric refraction into account.

4. Jupiter orbits the Sun on a slightly eccentric orbit tilted ever so slightly to the ecliptic. Let us neglect both those facts for a second and pretend that it circles the Sun in the ecliptic plane.

   a) How do right ascension and declination of Jupiter change during one Jupiter year, which is 11.862 Earth years?
   b) The ecliptic longitude of Jupiter on June 21, 2016 is $165°57'12''$. What are its *true* right ascension and declination?
   c) If we observe from Villanova at 10pm, what are its *apparent* right ascension and declination due to refraction?
   d) How much will precession of Earth change Jupiter's equatorial coordinates in one Jupiter year?
   e) EXTRA EXTRA CREDIT: How many nights in a row will Jupiter be visible at least 2 hours?

The best of luck, ladies and gents, make me proud!