

HOMework #4

Due date: Sep 18, 2017 – physical copy in Mary’s hands

1. If \mathbb{N} and \mathbb{E} are the equatorial and ecliptic poles, and X is the position of the star such that the angle $\mathbb{N}\hat{X}\mathbb{E} = 90^\circ$, show that X has no precession in right ascension.
2. We want to figure out how bad this precession business really is. Estimate (roughly) by how much did right ascension and declination of the vernal equinox change since the discovery of precession in 120 B.C.
3. Find a star with the largest change in right ascension and declination due to precession. Do this by simply picking random stars from the catalogs, look up their epoch 2000.0 coordinates, and "precess" them to present day. Then figure it out analytically.
4. Say you need an additional 15 minutes to complete this assignment, but you are worried that, due to weather, you'll lose power and you won't be able to see. At what latitude should you go today to gain those 15 minutes of daytime due to refraction?
5. Show that the Sun is the shape of an ellipse if you assume a simple refraction law ($R = k \tan \zeta$).
6. *Extra credit:* I challenge you to a programming contest: write a program that will provide atmosphere-corrected alt-az and equatorial coordinates for a non-circumpolar star of choice from starrise to starset.