ASTR368
HW2
January 26, 2024
Due February 2, 2024
2 points each part unless otherwise stated

1) (4 pt) Using data from Table 24.1, produce a plot of the thin and thick disk densities as a function of height above the Galactic plane z. Also include the sum of the thin and thick disks. Normalize using the constants in equation 24.9:

$$n(z, R) = n_0 \left(e^{-z/z_{\rm thin}} + 0.085 e^{-z/z_{\rm thick}} \right) e^{-R/h_R} \,, \tag{1}$$

where $z_{\rm thin}$, $z_{\rm thick}$, and h_R are the thin, thick, and radial scale heights. Try to do this in code if you have those skills.

2) Milky Way Components! We had in class that the average Milky Way star has a mass of 0.7 $M_\odot$. Assume that result is constant across the Galaxy.
a) (4 pts) Using data from Table 24.1 (from Version 2 of the book!), determine the B-band absolute magnitude of the various Galactic components and the total B-band absolute magnitude b) Using the data from Appendix G of your book and the color of an 0.7 $M_\odot$ star, what are the V-band absolute magnitudes for the components from 2a) and the total V-band absolute magnitude?
c) The disk and bulge have different stellar populations. Based on what you know about them, how would you expect the true V-band absolute magnitudes to differ from what you calculated in c)?

3) For the NFW dark matter density profile discussed in class, show that the
a) density goes as r^{-1} for $r \ll a$
b) density goes as r^{-3} for $r \gg a$
c) integral of the mass from $r = 0$ to $r = \infty$ is infinite.