AST 300B – Spring 2018

In-class/take-home Problem Due: Wednesday January 24

5. The energy density of the Interstellar Radiation Field (ISRF), due to background starlight from the Milky Way Galaxy, is $u_{ISRF} \sim 1.05 \times 10^{-12}$ erg cm^{-3}.

(a) Calculate the distance from the Sun in both AU and pc that the observed energy density from the Sun is equal to the energy density of the ISRF. How does this distance compare to the aphelion of Sedna of 936 AU (which is also in the range of the possible distance to a Planet 9)?

(b) What is the apparent magnitude m_V of the Sun at that distance where the energy densities are equal? How does the observed flux of the Sun at that distance compare to the observed flux of the full moon see from the Earth (m_V = -12.6 mag)? Hint: The absolute visual magnitude of the Sun is M_V = +4.83 mag.

6. Consider a non-isotropic radiation field with specific intensity expanded in a series as $I \sim I_0 + I_1 \cos(\theta) + \ldots$ Using the first two terms, derive how I_0 and I_1 are related to the flux and the energy density.