

ASTR368

HW#7

March 22, 2024

Due March 27, 2024

2 points each part unless otherwise stated

1) Explain Olber's paradox, and its resolution.

2) Electron scattering.

The current number density of electrons is about 0.2 m^{-3} . Assuming no change in the ionization fraction, what was the density when the CMB was created? Assume an equation of state $w = 0$. Use the Thompson cross-section $\sigma = 6.7 \times 10^{-29} \text{ m}^2$ to determine the mean-free-path of photons scattering off electrons then, and the time between interactions.

3) Our book derives the time-evolution of the Universe as a function of the scale factor for a flat Universe ignoring the radiation density parameter. What is the age of the Universe for the Planck values of the cosmological parameters? The Planck paper is here: <https://arxiv.org/pdf/1807.06209.pdf>. Take a look at Table 2 and select any of the models (just tell me which one!).