Assignment 6

What was the age of the Universe when it had

(a) room temperature, \( T = 300 \text{ K} \)?

(b) temperature \( T = 65 \text{ keV} \)? At this temperature the hydrogen burning reaction \( p + n \rightarrow D + \gamma \) becomes efficient enough to start the synthesis of heavier nuclei from the primordial mixture of protons and neutrons.

What is the qualitative difference between these two moments in the expansion history of the Universe?

For the present-day CMBR temperature, Hubble constant and matter density fraction take \( T = 2.73 \text{ K} \), \( H_0 = 67.4 \text{ km/s} \cdot \text{Mpc} \) and \( \Omega_M = 0.314 \). One megaparsec makes \( 1 \text{ Mpc} = 3.09 \cdot 10^{19} \text{ km} \).