

STELLAR PHYSICS

Homework 1 : due Thursday Feb 10, 5pm, to Alireza Mortazavi's mailbox

1. Take the mean density of the Universe at the present time to be $5 \times 10^{-27} \text{ kg m}^{-3}$. Calculate the free-fall collapse time (in years) of a system with this mean density. Comment.
2. Problem 1.1 of Phillips' textbook.
3. Problem 1.2 of Phillips' textbook.
4. Following from the discussion leading to equation (1.9) in the textbook, assume that the kinetic energy associated with motion in each of the three dimensions equals $\frac{1}{2}k_B T$ (this follows from the *equipartition theorem*), and then derive the relation giving pressure as a function of density and temperature for a classical (non-relativistic) ideal gas. This is the ideal gas equation of state.