

ASTR 425/525 Cosmology

Worksheet #5
Wednesday 09/03/2025

Question 1.

Consider a universe filled with a single energy component with a constant equation of state $p/\rho = w$.

- (a) Using the evolution equation for the energy density ρ , derive an expression for how ρ depends on the scale factor a .
- (b) Using the above result, how does the energy density of nonrelativistic matter ($w = 0$) depend on the scale factor? Does this result make sense? Can you explain it physically?
- (c) Using the above result, how does the energy density of radiation ($w = 1/3$) depend on the scale factor? Can you explain this result physically?

