PHYS 480/581
Cosmology

Worksheet #5
Wednesday 09/07/2022

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?