PHYS 480/581
Cosmology

Worksheet #6

Monday 09/12/2022

Question 1.

Argue that an initially expanding closed Universe ($k > 0$) filled with nonrelativistic matter ($\rho_{\rm m} = \rho_0/a^3$) will always recollapse into a Big Crunch. No need to solve a differential equation here; a qualitative argument is sufficient. Sketch the evolution of the scale factor from the Big Bang to the Big Crunch. The Friedmann equation here takes the form

$$H^2 = \frac{8\pi G\rho_0}{3a^3} - \frac{k}{a^2}. \tag{1}$$