Indian Institute of Science Education and Research, Mohali
Cosmology and Galaxy Formation (PHY654)
(January − April 2016)
Tutorial 3
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1. Given the solution for the spherical collapse in an Einstein-deSitter universe:

$$
\begin{aligned}
r &= \frac{r_{max}}{2}(1 - \cos\theta) \\
t &= \frac{H_i}{2\delta_i^{3/2}}(\theta - \sin\theta)
\end{aligned}
\tag{1}
$$

   where we have assumed that $\delta_i \ll 1$, obtain an expression for the scale factor and its limiting form at early times. [1]

2. Derive an expression for density contrast assuming that mass within a given shell is conserved. [1]

3. Obtain the limiting for of density contrast at early times and show that it evolves in proportion with the scale factor. Also calculate the constant of proportionality. [1]