PHYS 800
Special Topics in Cosmology

Jeremy Tinker
11/14/16
Inflation
Itty Bitty, Teenie Weenie, temperature fluctuations
Horizon Problem
Why were opposite sides of the universe the same temperature?

Horizon scale at time of CMB
Cosmic microwave background (CMB) even all throughout

14B yrs

14B yrs

THE 'HORIZON PROBLEM'

The opposite edges of the visible universe are 28 billion years apart. The universe is only 14 billion years old. And yet the temperature of the CMBR is uniform everywhere.
The Flatness Problem

Density 1 ns after BB

Scale Factor $a(t)$

$4.47225917218507401284015 \text{ gm/cc}$

$4.47225917218507401284016 \text{ gm/cc}$

$4.47225917218507401284017 \text{ gm/cc}$

$t \text{ [Gyr]}$
The Structure Problem
Inflationary Solution

[Graph showing the expansion of the universe over time, with a focus on the inflationary period.]
Solving the Flatness problem

- Radius = 10 cm
- Radius = 1 km
- Radius = $10^{48}$ m