

ASTRO 220 - Homework 6, Nov 10 2010

due Nov 17

1. Inflation

- a) Explain what the inflation paradigm is.
- b) List 3 cosmological problems that inflation addresses, and explain how and why each of these is solved by the inflation paradigm.
- c) What are the two basic ingredients one needs to create a Universe in the inflation paradigm?

2. Multiple universes

- a) The laws of physics and the content and age of the Universe appear “fine-tuned” to allow the development of life. Explain this statement.
- b) Explain why the idea of a “multiverse” is an attractive solution to this apparent fine-tuning.

3. Contemplating universes

Contemplate the likelihood of the development of life on an Earth-like planet in the following universes (all in the context of the inflation paradigm):

- a) A universe with no symmetry-breaking
- b) A universe with strong symmetry-breaking, with a particle to photon ratio of 10^{-7} instead of 10^{-9}
- c) A universe without density fluctuations
- d) A universe where the cosmological constant Λ had not decayed by as much as it did (i.e., by a factor of, say, 10^{10} rather than a factor of $\sim 10^{130}$)

And from Universe:

Chapter 27: 8, 12, 18, 25, 40