UCSD Physics 162 — *Cosmology* — Assignment 2

Prof. B. Keating   Assigned: April 14, 2009   Due: April 21 In Class

$\boxed{1}$ Equivalence Principle

(a) Define the equivalence principle, and research on the WWW some of the classical tests of the equivalence principle.

(b) What are the restrictions that apply to laboratory tests of the equivalence principle? For example, can a laboratory in a gravitational field determine that it is not-accelerating but rather experiencing a gravitational force, if it is arbitrarily large? Make a sketch to defend your answer.

$\boxed{2}$ Horizons

Define the Horizon distance. What is it for our universe? What is the scale over which the cosmological principle (CP) holds, observationally? How many regions in which the CP holds can 'fit' in our universe?

$\boxed{3}$ Hubble's Law

Assume that in our Universe there are no forces to acceleelerate/decelerate galaxies as they recede away from each other.
Consider a galaxy at a distance $d = 100 Mpc$. Lets call this galaxy G.

(a) How fast is G rec receding away from our galaxy? Assume $H_0 = 70$ km/s/Mpc.

(b) Imagine that a supernova explosion takes place in our galaxy. What will be the distance between our galaxy and G when astronomers in G detect the supernova explosion?

(c) How much time passes between the supernova explosion in our galaxy and the time of its detection in G?

$\boxed{4}$ Ryden HW Problem 3.1

$\boxed{5}$ Ryden HW Problem 3.3

$\boxed{6}$ Ryden HW Problem 3.4