Problems 3

1) Work out the classic cosmic tests (luminosity distance, angle distance, source counts) for the $k \neq$ FRW universes, for small z. Then determine how to measure the (spatial) curvature of the Universe.

2) Calculate the drag on charged particles moving through the e-wave background. How does this affect the growth of ~~grav~~ small inhomogeneities by gravitational attraction?

3) What would be the qualitative effect of the following on light nuclear abundances? Say whether d/p & $^4He/p$ would go up, go down, or remain pretty constant in response to:

a) larger n_B/n_γ

b) G_F smaller (weak interaction slower)

c) more neutrino species

d) G_N larger (gravity stronger)

e) α smaller

f) α_s smaller

[g) m_u, m_d, m_e, m_μ vary : optional - this could be a research project]

What are the anthropic implications - how sensitive is the existence of life as we know it to all these factors?