Assignment #11

1. What did Hubble claim concerning the dynamics of galaxies? What observed phenomena did Hubble use to establish this?

2. What role does *critical density* play in Robertson-Walker solutions to the Einstein equations? What role does *dark matter* play in determining the relation between the average density of matter in our universe and the critical density?

3. What is the Horizon Problem for Robertson-Walker spacetimes? In what sense is it not a problem?

4. (a) What would a robot falling into a black hole see?
   (b) How would the fall of the robot appear to an observer watching from a safe vantage point?