Astronomy 321: Assignment #4

1. A typical cluster of galaxies has a radius of 1 Mpc that encloses a mass of 10^{15} $M_\odot$. The velocity dispersion is 1000 km/s? Compute the crossing time of the cluster and compare that to the "gravitational collpase time" $\sim (G\rho)^{-1/2}$. Give a physical argument why these two timescales are similar.

2. Assume that all stars in a galaxy that contribute to the light of a galaxy obey a relation between there luminosity and mass (in solar units) of the form $L = M^{3.5}$. Determine the mass-to-light ratio (M/L) for the cases of :

- 1000 0.2$M_\odot$and 10 20$M_\odot$stars
- 1000 0.1$M_\odot$and 100 1$M_\odot$stars
- 10000 0.2$M_\odot$, 100 1$M_\odot$and 1 20$M_\odot$stars

3. Show that the escape velocity is given by:

$$V_{esc} = \sqrt{\frac{2GM}{R}}$$

and then rewrite the escape velocity so that it is in units of density and Mass only.

Assuming our Galaxy to have mass of 10^{12} $M_\odot$and a density of 10^{-24} grams per cubic centimeter. Calculate the escape velocity from our Galaxy as well as for the galaxy cluster of problem #1.

4. Go to this URL: http://homework.uoregon.edu:8080/rcurve/rcurve.jnlp.

Here you will fit mass models to all the galaxies in the drop down menu except M33. Find the best fitting halo+disk model to each galaxy and record the relevant parameters. Pay paricular attention to the galaxies N7 and UGC 128 and comment on what is strange or remarkable about your best fits for those two galaxies.