Cassandra Bodin
Homework 3: Questions

1) How does the total mass of MW and M31 compare in this simulation? What galaxy component dominates this total mass?

    Total Mass MW= 2.06x10^12 Msun
        Mass halo=1.975x10^12 Msun
        Mass disk=0.075x10^12 Msun
        Mass bulge=0.01x10^12 Msun
    Total Mass M31=2.06x10^12Msun
        Mass halo=1.921x10^12 Msun
        Mass disk=0.12x10^12 Msun
        Mass bulge=0.019x10^12 Msun

    In this simulation the total mass of both galaxies are approximately equal. For both galaxies the mass in the halo dominates.

2) How does the stellar mass of the MW and M31 compare? Which galaxy do you expect to be more luminous?

    Stellar Mass MW=0.085x10^12 Msun
    Stellar Mass M31=0.139x10^12 Msun

    The mass of MW is .6 times the mass of M31. M31 is bigger.
    I would expect M31 to be more luminous because the stellar mass is larger which implies there may be more larger mass stars. Larger mass stars are more luminous, therefore I would expect M31 to be more luminous

3) How does the total dark matter mass of MW M31 compare in this simulation (ratio)? Is this surprising, given their difference in stellar mass?

    Dark Matter/ Halo Mass MW=1.975x10^12 Msun
    Dark Matter/ Halo Mass M31=1.921x10^12 Msun

    The mass of dark matter in the MW galaxy is larger than the mass in the M31 galaxy. The mass of M31 is .97 times the mass of MW.
    I do find this to be slightly surprising considering in the previous question we found that there was more stellar mass in the M31 Galaxy than the MW Galaxy. Which is the opposite as we found in terms of the mass of the dark matter. I would have guessed they would be correlated.

4) What is the Baryon fraction? In the universe, omega_b/omega_m ~16% of all mass is locked up in baryons (gas and stars) vs dark matter. How does this ratio compare to the baryon fraction you computed for each galaxy? Given that the total gas mass in the disks

of these galaxies is negligible compared to the stellar mass, any ideas for why the universal baryon fraction might differ from that in these galaxies?

The baryon fraction compares the amount of gas and stars in a galaxy to the amount of dark matter.

Baryon fraction MW=0.41 or 4.1%
Baryon fraction M31=0.067 or 6.7%
Baryon fraction M33=0.046 or 4.6%

The baryon fractions for each of the galaxies were much lower than the omega_b/omega_m. The baryonic fraction is about a quarter of the omega fraction.

The universal baryon fraction could possibly differ if the gas wasn't in the disk? Or maybe it is dependent on the type of galaxy? I am not really sure.