Homework 3

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Table of Mass Values by Type for MW, M31, and M33

Galaxy Name	Halo Mass(Msun)	Disk Mass(Msun)	Bulge Mass(Msun)	Total(Msun)	fbar
Milky Way	1.97493e+12	7.5e+10	1.0005e+10	2.05993e+12	0.041266
M31	1.92088e+12	1.2e+11	1.905e+10	2.05993e+12	0.0675023
M33	1.86613e+11	9.3e+09	0.0	1.95913e+11	0.0474701

Question 1

The total mass of M31 and the Milky Way are the same in this simulation. The mass is dominated by the halo mass, by an order of magnitude in M31's case or two in the case of the Milky Way.

Question 2

The Milky Way has a lower disk mass and an identical bulge mass compared to M31, suggesting that its stellar mass is lower than M31. Since most of the light in a galaxy comes from stars, this means M31 is more luminous.

Question 3

The halo (dark matter mass) of the Milky Way is greater than the Halo Mass of M31. This isn't surprising in the sense that they both have the same total masses and M31 has the greater baryon mass. It is surprising in the physical sense, since I might expect that the presence of more luminous matter would correspond to a greater mass of dark matter.

Question 4

The Milky Way has a baryon ratio of 4.1%, M31 a ratio of 6.8%, and M33 a ratio of 4.7%. However, this is much smaller than the universal baryon fraction of 16%. The missing mass could be found in globular clusters that weren't included in the halo mass, or extra-galactic clouds of gas and dust that are too cold spread out, and distant to emit.