ASTR400B Homework 3

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1. The total mass of both the Milky Way and M31 are very similar. Neither will dominate in this simulation, however, M33 is much smaller than both.

2. The stellar mass of M31 is higher than that of the Milky Way ($\sim$ 1.5 times), so we should expect that M31 is brighter.

3. The Milky Way actually has a higher mass and ratio of dark matter than M31. This is surprising since M31 has more stellar matter.

4. The Baryon fraction for each galaxy is presented in Table 1. For all galaxies in the local group, this fraction is lower than that of the Universe. This may be caused by differences in mass accretion between dark matter and baryons. Maybe dark matter accretion is easier.

Table 1: Local Group Mass Components

Galaxy	Halo $10^{12} M_\odot$	Disk $10^{12} M_\odot$	Bulge $10^{12} M_\odot$	Total $10^{12} M_\odot$	f_{bar}
MW	1.974925	0.075	0.010005	2.05993	0.041265965
M31	1.92088	0.12	0.01904997	2.05992997	0.06750228
M33	0.186613	0.0093	0	0.195913	0.04747005
Local Group	4.082418	0.2043	0.02905497	4.31577297	0.054070261