

ASTR400B Homework 3

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Question 1. The mass of the Milky Way and Andromeda is approximately the same, and both are dominated by the halo in each galaxy.

Question 2. The ratio of stellar mass to total mass, or f_{bar} , is larger for Andromeda (0.067, or 67%) than the Milky Way (0.041, or 41%).

Question 3. The ratio of mass for the halo (where dark matter mass resides) of Milky Way to Andromeda is $1.975/1.921$, or approximately 1.03, meaning the halo of Milky Way is about 3% more massive than the Andromeda. In terms of stellar mass, they both have about the same bulge mass, but Andromeda has a much greater disk mass than the Milky Way, which is why their total masses turn out to be relatively equal.

Question 4. The baryon fraction for the Milky Way is 0.041 (4.1%), 0.067 (6.7%) for M31, and 0.046 (4.6%) for M33, making the baryon fraction for the Local Group (its most massive members) to be 0.097. If baryons only account for 16% of the Universe's mass, these galactic fractions are much less than the universal fraction. If gas mass in the disks is negligible, perhaps there is a mechanism that is stripping galaxies of their gas and other baryons and sending them out of the galaxies (streams, collision results?), or maybe there just isn't enough gas put into the disks when the galaxies were formed.