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ASTR 400B HW # 3

Due 2/6/2025

Table:

Galaxy Name	Halo Mass 10^{12} $M_\odot$	Disk Mass 10^{12} $M_\odot$	Bulge Mass 10^{12} $M_\odot$	Total Mass 10^{12} $M_\odot$	f_{bar}
Milky Way	1.975	0.075	0.01	2.06	0.041
M31	1.921	0.12	0.019	2.06	0.067
M33	0.187	0.009	0.0	0.196	0.046
Local Group	4.083	0.204	0.029	4.316	0.054

Answers:

1. Both the Milky Way and M31 have a total mass of 2.06 * 10^12 solar masses. For both of these galaxies, the component of the halo mass dominates the overall value.
2. The stellar mass of M31 is larger than the Milky Way's (the combination of disk and bulge is larger), and therefore I expect it to be more luminous than the Milky Way since it should have more stars that are emitting.
3. M31 has an overall higher ratio, showing that they have more stellar mass versus dark matter than the Milky Way has. This is unsurprising considering that they have the same overall mass, but M31 has more stellar mass, as it should therefore have a higher ratio than the Milky Way.
4. The baryonic values can be seen in the final column of the table, which ranged from 0.041 to 0.067. Since the universe value is about 0.16, this means that our baryonic rations are between 2-4 times less than the values for the universe. This difference possibly comes from accounting for dust and gas that is not included inside galaxies as they would not contribute to the dark matter mass and instead increase the baryonic value. Another possibility is that these galaxies are very dark matter dominant as compared to the rest of the universe, though it is more likely that there is other gas and dust in the overall interstellar medium that can account for this ratio.