HW3Questions

February 5, 2025

[25]:
```
import numpy as np
import astropy.units as u
import pandas as pd
from ReadFile import Read
import matplotlib.pyplot as plt
from ComponentMassFuncs import MassFrame
from ComponentMassFuncs import ComponentMass
```

[27]:
```
df = MassFrame(['MW_000.txt','M31_000.txt','M33_000.txt'])
fig, ax =plt.subplots(figsize=(15,1))
ax.axis('tight')
ax.axis('off')
the_table = ax.table(cellText=df.values,colLabels=df.columns,loc='center')
```

Galaxy Name	Halo Mass (1e+12 solMass)	Disk Mass (1e+12 solMass)	Bulge Mass (1e+12 solMass)	Sum (1e+12 solMass)	Fraction (1e+12 solMass)
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	0.196	0.046

0.1 Questions

0.1.1 Question 1

The sum of the total mass for the Milky Way and M31 is the same, however the distribution of those masses is different. The Milky Way has more mass in its Halo, and M31 is more massive in its Disk and Bulge. On both cases the component that dominates the mass of these galaxies is the Halo Mass by a lot, meaning Dark Matter. In the last column of the table we can see that the ratio of baryonic matter to dark matter is smaller for the Milky Way.

0.1.2 Question 2

Since only the Halo Mass would be comprised of Dark Matter, I would say that M31 appears more luminous than the Milky Way, meaning it has more stellar mass than the Milky Way.

0.1.3 Question 3

[45]:
```
ratio = ComponentMass('MW_000.txt', 1)/ComponentMass('M31_000.txt', 1)
print(f'ratio of total dark matter in the MW vs M31: {ratio:.3f}')
```

```
ratio of dark matter in the MW vs M31: 1.028
```

I would say it can be surprising. If one previously thought that the dark mass of a galaxy needs to be proportional to the baryonic mass, than that would seem very strange and maybe even enough to weaken that idea. This also brings up questions on what exactly determines the amount of dark matter in galaxies.

0.1.4 Question 4

As the last column on the table shows, for both the Milky Way and M31 that ratio is much lower (around 5%). Assuming this is the case for most of the other galaxies in the Universe, then there should be another place where baryonic mass can be. Perhaps in the space in between these galaxies (?)

[ ]:
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