Grading Rubric : ASTR400B Research Assignment 2

Name: [Cardona,Alondra](https://github.com/alocardona/astr400b)

**A Introduction 9 / 10**

Each of the below points should be a separate paragraph in your introduction.

1. Define the Proposed Topic. 1/1
2. State why this topic matters to our understanding of galaxy evolution. 2/2
3. Overview our current understanding of the topic. 2/2
4. What are the open questions in the field? 2/2
5. Cite at least 3 journal papers. Use BibTex for formatting citations 1/1
6. Include at least one figure with caption from those papers to motivate your work. 1/2

**B. The Proposal 7/ 10**

They must answer each of the below questions as separate subsections.

1. What specific question(s) will you be addressing? 1/1
2. How will you approach the problem using the simulation data? Here you should outline the codes you’d need to write. It can be in general terms. 4/5
3. Include at least one figure that illustrates your methodology. 1/2
4. What is your hypothesis of what you will find? Why do you think this will occur? 1.5/2

**C. Misc. 5/5**

1. Proper Grammar 1/1
2. Included a bibliography 1/1
3. In Latex and ApJ/MNRAS formatting 2/2
4. On Time/On Github 1/1

**TOTAL** 21**/25**

**Late Penalty:**

* if submitted on due date, but after 5 PM  **(-5 points).**
* Proposals will **not be accepted** after the due date.

**Comments: -1: need more detailed caption for Fig 1. -1: Do you plan to analyze velocity gradients and velocity dispersion as well ? How ? -0.5: figure resolution, -1: need better justification of your hypothesis and it should connect to the specific questions you are asking. Talk to us.**

**You don’t need to plot the rotation curve.**

**To study the kinematics of the stream debris of M33 consider the following:**

1. **Pick a few snapshots using the orbit of M33 computed in Homework 6. Interesting points in time might be at pericenter (closest approaches) and apocenters (furthest approaches). Maybe start with 3 different points in time, with one being after the MW-M31 merger has happened**
2. **Make a plot of the M33 stars (all stars) in each snapshot - might be easiest to plot this in the M31 center of mass frame since the whole system is in orbit about M31. This will help you visualize what is going on.**
3. **Write a code to Compute the Jacobi Radius for M33 in each snapshot. Plot that Radius on top of the plot from Step 2.**
4. **Write a code that selects stars outside the Jacobi Radius.**
5. **Make different plots of the kinematics of those stars. It’s likely more interesting to look at the kinematics in a coordinate system centered on M31 because more of those stars will be in orbit about M31. You could plot e.g. the radial velocities (dot product of the 3D velocity vector of the stream stars with their position vector from M31) of all the stream stars as a function of their distance from M31. Or even color code the stream stars in the plot in step 2 by their radial velocity. there are likely other plots that could be interesting.**

**This paper might also be useful**

**Bonaca \& Price-Whelen New Astronomy Reviews, Volume 100, id.101713, 2025**

**See their Figure 1.**