ASTR400B Homework 7

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1. See images.

2. The plots are similar only for the first billion or so years. After that the analytical solution strongly deviates, with M33 beginning a massive orbit around M31.

3. We have treated M33 as a massless point, and used acceleration profiles to model M31. This means M33 has no effect on M31, and physics like tides, friction, etc. is not accounted for. We also only considered the relative position and velocity of the two galaxies at the very beginning, and did not consider the eventual acceleration and merger that M31 experiences. All of these things could contribute to the deviation we see.

4. If we wanted to include the Milky Way, we could model it in the same way that we modeled M31, using acceleration profiles based on mass and characteristic radius. We would also have to somehow change its position during the simulation, since the MW is heading for a merger with M31.