Second exercise: Evolution of a satellite galaxy in a host gravitational potential

1. Generate initial conditions (positions and velocities) for N = 10,000 particles, assuming they are distributed according to a Plummer profile, with mass $M = 10^5$ Msun and scale b = 100 pc. Use the form of the distribution function associated to this density profile (under the assumption that the velocity distribution is isotropic) to generate the velocities of the particles.
2. Plot the distribution of particles in x vs y, and also make a histogram of the number of particles as function of spherical radius. Does it behave as you expect? What is the 1D velocity dispersion of the particles?

3. Place the set of particles (which we call the satellite) in the host discussed in the first laboratory and on the orbit you selected then. Integrate the orbits of the individual particles using the integrator you developed. The total integration time should be somewhere between 5 and 8 Gyr (depending on the orbital period, somewhere between 10 and 50 radial orbital periods).
4. Plot the spatial distribution of all particles (x vs y, x vs z) at different times (t = 0 Gyr, and at 4 other evenly distributed times)
5. Select particles at some spatial location at the final time, and plot their velocities (vx vs vy, vy vs vz). Make also plots showing the velocities of all the particles.

6. Answer the following questionnaire:
   - How does the spatial distribution of particles change with time?
   - How well do they trace the initial orbit you selected? Can you explain why?
   - For how long is it possible to distinguish the orbit?
   - At a given location in space, how are the velocities of the particles?
   - What can one conclude from this experiment about the issue of mergers and accretion? Can these events be recovered? Under what conditions?