ASTR 400B Lab 6

1 First Step

Make sure to have a cloned copy of your own repository on your computer (or nimoy if you are using nimoy for Jupyter). Create a directory Labs/Lab6.

From the command line git clone the class repository. If you have already done this, git pull to update the repository. There is a directory Labs/Lab6/ with a file Lab6.ipynb or Lab6.py, which is the template for this exercise.

Copy this template to your own repository directory Labs/Lab6

2 Sersic Profiles

In this lab we will use Homework 5 solutions to compute the mass profile of the Milky Way's bulge. We will turn the mass profile into a density profile and see if we can fit it reasonably well with a sersic profile.

2.1 Part A

Create a function called *SersicE* that returns the Sersic Profile in terms of the effective radius R_e (i.e. the half light radius).

$$I(r) = I_e exp^{-7.67((r/R_e)^{1/n}-1)} \tag{1}$$

$$L = 7.2 I_e \pi R_e^2 \tag{2}$$

R_e is the half light radius. We will assume a mass to light ratio for the stellar bulge of 1, so this is also the half mass radius.

The function should take as input: the radius, R_e, n and the total stellar mass of the system.

2.2 Part B

1. Create an instance of the MassProfile Class for the MW. Store it as a variable MW.

2. Create an array of radii from 0.1 kpc to 30 kpc in increments of 0.1

3. Define a new array called 'BulgeMass', that uses the function *MassEnclosed* within MassProfile to compute themass profile of the bulge. Get rid of astropy units in *BulgeMass* by adding *.value.*

4. Compute the surface mass density profile for the simulated bulge and store it as an array called *BulgeI*. Assuming M/L 1 this is also the surface brightness profile in $L_\odot/\mathrm{kpc}^2$

2.3 Part C

Compute R_e, the half mass radius, for the bulge

2.4 Part D

- Plot the surface density profile of the simulated bulge
- Plot the corresponding Sersic profile, assuming a de Vaucouleurs Profile.
- If the profiles don't match, try changing either R_e or n