Astrophysics IV: Stellar and galactic dynamics

Exercises

Problem 1:

Derive the potential of a razor-thin infinite slab of constant surface density Σ_0.

Problem 2:

Derive the potential of an infinite wire of constant linear density λ_0.

Problem 3:

Demonstrate that a Keplerian potential generates elliptical orbits.

Problem 4:

Using the formula seen during the lectures, demonstrate the three Kepler law:

- The orbit of a planet is an ellipse with the Sun at one of the two focii.
- A line segment joining a planet and the Sun sweeps out equal areas during equal intervals of time.
- The square of a planet's orbital period is proportional to the cube of the length of the semi-major axis of its orbit.