Homework 5.   AST506

- (1) Given: A stationary stellar-dynamic spherical system has density profile $\rho(r)$. Find equilibrium velocity dispersion $\sigma_v^2(r)$ assuming that the velocities are isotropic $\beta(r) = 0$.

- (2) For a stationary stellar-dynamic spherical system with $\beta(r) = 0$ find density profile $\rho(r)$, which gives "isothermal" velocities $\sigma_v^2(r) = const = \sigma_0^2$. Try solutions in the form of power-laws.

- (3) For a spherical stellar-dynamic system with $\beta = 0$ and density profile

$$\rho(r) = \frac{\rho_0}{x(1+x)^2}, \qquad x \equiv \frac{r}{r_0} \tag{1}$$

  find the velocity dispersion at $r = 0$.

- (4) For an isothermal stellar-dynamic plane distribution (dependence only on z) the density is

$$\rho(z) = \rho_0 (z/z_d)^{-2}$$

  and the rms velocities are

$$v(z) = \text{const} = v_z.$$

  Find the relation between ρ_0, z_d and the velocity dispersion v_z^2.