

Homework 4. AST506

- (1) Infinitely long filament has density

$$\rho(r) = \rho_0 \exp \left[-\frac{r}{r_0} \right], \quad (1)$$

where r is the distance to the center of the filament. Find the acceleration $g(r)$ and make qualitative analysis of dependence of gravitational potential U of radius r .

- (2) Distribution of density in the solar neighborhood can be approximated with the following function of distance z perpendicular to the plane of the galactic disk:

$$\rho(z) = \rho_0 \exp \left[-\frac{z}{z_d} \right], \quad (2)$$

Find acceleration $g(z)$ and gravitational potential $U(z)$ for the system. Present your results in units of surface density Σ and relative distance from the plane z/z_d .