Homework 2

We observe stellar population in an elliptical galaxy. Measurements indicate that one-dimensional velocity dispersion σ_v is constant and equal $\sigma_v = 300 \text{ km/sec}$. After inverting the surface brightness profile we find that the 3-d number density of stars n declines with the distance r from the galaxy center as $n(r) \propto r^{-\alpha}$ with $\alpha = 2.5$

Assuming that velocity dispersion is isotropic (all three components of velocities are statistically the same implying the velocity anisotropy parameter $\beta = 0$) use the Jeans equation to find the total mass (stars, gas and dark matter) of the galaxy inside (a) 10 kpc and (b) 100 kpc. Give the answer in units of the solar mass.