

Problem Set 2

Problem 1: Incompressible star in General Relativity

Solve the Tolman-Oppenheimer-Volkov equation for a star of constant density $\rho = \rho_c = \text{const}$ to obtain an expression for $P(r)$ in terms of M and R .

Problem 2: Mass-Radius curve

Numerically solve the Tolman-Oppenheimer-Volkov equation for the two-component polytrope described in the lecture for various different central densities from $10^{17.5} \text{ kg m}^{-3}$ to $10^{20} \text{ kg m}^{-3}$ to obtain a Mass-Radius curve such as the one shown in the lecture.

Explore how the Mass-Radius curve changes by changing the equation of state (i) by changing the value of Γ_1 and (ii) by changing the value of ρ_1 .