Analysis of Equations of State for Neutron Star Modelling

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Outline

- What is an equation of state (EoS)? How do they fit into our model of a neutron star?
- Using an Eos to make macroscopic predictions
- Analysis and derivation of two EoSs:
  - QHD-I
  - NL3

Equation of State (EoS)

- A relationship between *energy density* (denoted ϵ) and pressure (denoted P)
  - $\epsilon = \epsilon(P) \quad \Leftrightarrow \quad P = P(\epsilon)$
- Encodes the fundamental interparticle interactions within a neutron star
- True EoS within a neutron star is unknown; multitude of candidates, each based on a slightly different model

Using an Equation of State to Make Predictions

- TOV equations
- Mass rad

TOV Equations

- The Tolman-Oppenheimer-Volkoff Equations