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# Spherically symmetric solutions to the Euler-Poisson equations and the Einstein-Euler equations

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## Abstract

We can construct spherically symmetric solutions to the evolution equations of gaseous stars in the non-relativistic and relativistic theory. The solutions are close to an equilibrium, governed by the Lane-Emden or the Tolman-Oppenheimer-Volkoff equation, plus a small time periodic solution to the linearized equations at the equilibrium, and touch the vacuum with the so called physical vacuum boundary. Detailed discussions can be found at arXiv:1210.5769 and arXiv:1410.1234. But the study already done assumes that  $\gamma/(\gamma - 1)$  is an integer, where  $\gamma$  is the adiabatic exponent of the gas near the vacuum. To extend the result at least to the case when  $\gamma = 5/3$  and so on is an important open problem.

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