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Self-gravitating compact objects

Clouds of dusts containing hydrogen in abundance are very common in the Universe. For some reason, this system can have gravitational instabilities, later generating a star that can have three possible finals: Black Holes, White Dwarfs or Neutron Stars. The latter was studied in this work, which has the main objective of defining the profile of these stars, by finding the mass x ratio curve for a specific equation of state. Therefore, it was introduced the concepts of General Relativity, considering the Schwarzschild metric on a perfect fluid, in order to find the Tolman-Oppenheimer-Volkoff equations. A program in FORTRAN95 was created to solve these equations using the fourth order method of Runge-Kutta for a certain equation of state; the user has to insert the central density of the star and it analyses the case where the pressure is zero (corresponding to the star border), returning the values of mass and ratio at this point (which corresponds to the total mass and the star ratio). Based on some values of central density, the stars behavior can be analyzed from a graphic of mass x ratio curve for an equation of state, which values were obtained from the program.

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