Galactic rotation curves as solutions of Lane Emden equation of dark matter.

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Polytropic dark matter halo is a new approach to address the dark matter problem. In this work the Lane Ã¢â‚¬â€œEmden equation for configuration of dark matter and gas is constructed and solved. Finite solutions are obtained for gas polytropic indices, n= 0 Ã¢â‚¬â€œ 5 and dark matter polytropic indices, m= 1 Ã¢â‚¬â€œ 5. The central value of the ratio of dark matter to gas density, ÃŽÂ²=Ã• Â• _{dm(0)}/Ã• Â• _{g(0)} is taken as 0.1, 1 and the cosmological ratio ~5.46.

Both compact and extended configurations are obtained through density profiles deduced from the solutions of the Lane Ã¢â‚¬â€œEmden equation. Rising and flat rotation curves are found to arise naturally from the dark mass profiles of the solutions. Whereas lower dark matter index (m=1, 2) gives rapidly rising and high amplitude rotation curves, flatness of rotation curves becomes prominent for m=3 Ã¢â‚¬â€œ 5. The galaxy types represented by the rotation curves deduced from dark matter polytropic indices are inferred. Impact of gas on redistribution of dark matter is indicated.