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Stellar Structures in Two-Dimensions

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Abstract: We have presented stellar structure in two-dimensions, Friedmann cosmology in two-dimensions and Schwarzschild-like solutions in two-dimensions.

1. Introduction

We have presented and obtained the field equations of a completely geometric Lagrangian based dynamical theory of gravitation in two dimension by using algebraically extended Hilbert theory of extension was investigated so as to give a framework where nontrivial geometric Lagrangian based extension of general theory of relativity could be studied.

Let us consider a self-gravitating body of mass M and radius R, so it will have gravitational potential energy

$$U - (GM^2/R) \tag{1.1}$$

If it is in equilibrium, then temperature T reads

$$Nk_{_B}T \approx (GM^2/R) \tag{1.2}$$

or

$$T \approx (GMm_p/k_BR). \tag{1.3}$$

Let us consider a spherically symmetric star in a steady state where all physical variables depend on only radial coordinate r. The equation for hydrostatic equilibrium of a such a star is given as

$$\frac{dp}{dr} = p' = -G\frac{G(r)\rho(r)}{r^2}, \tag{1.4}$$

where p(r) and $\rho(r)$ be the pressure and density respectively at radius r and M(r) be the mass within the sphere of radius r, with

$$\frac{p(r)}{dr} = 4\pi r^2\rho. \tag{1.5}$$