



CONTINUOUS GALERKIN METHOD AND LANE-EMDEN EQUATIONS

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Abstract. Lane-Emden type equations arise various physical phenomena in mathematical and astrophysics like stellar structure, thermionic currents, thermal explosions, radiative cooling, CTC, etc. In this work, we consider a model by considering the equation

$$\begin{cases} (x^\beta y'(x))' + x^\beta f(x, y) = 0, & 0 < x < 1, \\ y'(0) = 0, \quad b_1 y(1) + a_1 y'(1) = c_1. \end{cases} \quad (p)$$

For $\beta = 1$ and $\beta = 2$, the singular differential equation (p) has been considered by (Chambre ([9]), Chandrasekhar ([10]), Keller ([42]), Goodman and Duggan ([22])). Here, we apply continuous Galerkin finite element method (CGFEM) by choosing the Lagrange linear and quadratic polynomials as a test and trial functions. We approximate the integral value of nonlinear function by using trapezoidal and Simpson's $\frac{1}{3}$ rule. We compare the numerical results with other numerical results computed by various methods. Residue table shows that our proposed techniques are efficient, convenient and promising in the existing literature.

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