

Effects of Heat Transfer on the Stagnation Flow of a Third-Order Fluid over a Shrinking Sheet

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This paper is devoted to the study of a stagnation point flow of an incompressible third-order fluid towards a shrinking sheet (with heat transfer). The governing nonlinear partial differential equations are reduced into nonlinear ordinary differential equations by means of a similarity transformation and then solved by the homotopy analysis method. Two types of flow problems, namely, (i) two dimensional stagnation flow toward a shrinking sheet and (ii) axisymmetric stagnation flow towards an axisymmetric shrinking surface have been discussed. Also, two types of boundary conditions are taken into account: (i) prescribed surface temperature (PST) and (ii) prescribed heat flux (PHF) case. The effects of various emerging parameters of non-Newtonian fluid have been investigated in detail and shown pictorially. The convergence of the solutions have been discussed through \hbar -curves and residual error. For further validity, the homotopy Padé approximation is also applied.

Key words: Stagnation Flow; Heat Transfer; Third-Order Fluid; Shrinking Sheet; Homotopy Analysis Method.