Radiation effect on viscous flow of a nanofluid and heat transfer over a nonlinearly stretching sheet

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Abstract:

In this work, we study the flow and heat transfer characteristics of a viscous nanofluid over a nonlinearly stretching sheet in the presence of thermal radiation, included in the energy equation, and variable wall temperature. A similarity transformation was used to transform the governing partial differential equations to a system of nonlinear ordinary differential equations. An efficient numerical shooting technique with a fourth-order Runge-Kutta scheme was used to obtain the solution of the boundary value problem. The variations of dimensionless surface temperature, as well as flow and heat-transfer characteristics with the governing dimensionless parameters of the problem, which include the nanoparticle volume fraction , the nonlinearly stretching sheet parameter n, the thermal radiation parameter NR , and the viscous dissipation parameter Ec, were graphed and tabulated. Excellent validation of the present numerical results has been achieved with the earlier nonlinearly stretching sheet problem of Cortell for local Nusselt number without taking the effect of nanoparticles.

Keywords:

nanofluid nonlinearly stretching surface viscous dissipation thermal radiation.

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