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Unsteady three-dimensional free convection flow near the stagnation point over a general curved isothermal surface in a nanofluid

Absract
This study deals with an unsteady three-dimensional free convection flow near the stagnation point region over a general curved isothermal surface placed in a nanofluid. Nanofluids are great scientific interest because these new thermal transport phenomena surpass the fundamental limits of conventional macroscopic theories of suspensions. Since the heat and mass transfer are very extensive in the industry, the unsteady three-dimensional body near stagnation point can give a significant impact on the heat transfer process. The main objective of the present study is to investigate the effects of some governing parameters on the skin friction coefficients, local Nusselt and local sheerwood numbers as well as related profiles of unsteady free convection in a nanofluid. The momentum equations in x-and y-directions, energy balance equation, and nanoparticle concentration equation are reduced to a set of four fully-coupled nonlinear differential equations under appropriate similarity transformations. The well-known technique Keller-box method is used numerically for different values of governing parameters entering these equations. Further, the present results have been compared with the previous published results for a particular case and the comparisons are found to be in good agreement. The skin friction, local Nusselt number and Sherwood number is increases with an increase in curvature parameter. Rising values of the Lewis number and Brownian motion parameter has enhanced the flow while rising values of the buoyancy and thermophoresis parameter will decelerate the flow. The temperature profile is increases when Brownian motion, buoyancy and thermophoresis parameter increases and concentration profile increase with an increases in buoyancy and thermophoresis parameter.

Keywords
Free convection; Nanofluid; Numerical solution; Stagnation point; Three-dimensional