Stagnation-Point Flow towards a Stretching/Shrinking Sheet in a Nanofluid: A Stability Analysis

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Abstract : The characteristics of stagnation point flow of a nanofluid towards a stretching/shrinking sheet are investigated. The governing partial differential equations are transformed into a set of ordinary differential equations, which are then solved numerically using MATLAB routine boundary value problem solver bvp4c. The numerical results show that dual (upper and lower branch) solutions exist for the shrinking case, while for the stretching case, the solution is unique. A stability analysis is performed to determine the stability of the dual solutions. It is found that the skin friction decreases when the sheet is stretched, but increases when the suction effect is increased. It is also found that increasing the thermophoresis parameter reduces the heat transfer rate at the surface, while increasing the Brownian motion parameter increases the mass transfer rate at the surface.