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Impact of nanoparticles on flow of a special non-Newtonian third-grade fluid over a porous heated shrinking sheet with nonlinear radiation
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Abstract
This research peruses the characteristics of heat and mass transfern of a special non-Newtonian third-grade fluid over a porous convectively-heated shrinking sheet filled with nanoparticles. The Buongiorno model is used for the special non-Newtonian third-grade fluid that includes both the Brownian motion and the thermophoresis effects with non-linear radiation. The nonlinear system of ordinary differential equations are obtained using a suitable transformation. The converted system of equations are then numerically solved using shooting method. The numerically-obtained results for the skin friction, local Nusselt number and the local Sherwood number as well as velocity profile, temperature distribution and concentration of nanoparticle are illustrated for different physical parameters through graphs and tables. On the behalf of the whole studies, final conclusions are made and it is observed that multiple solutions are achieved for certain values of the suction parameter. Further, the non-Newtonian parameter reduces the velocity of the fluid and increases the temperature and the concentration profiles for the first solution while the reverse trend is seen for the second solution. Finally, a comparative analysis is made through previous studies in limiting cases and shown good correlation.

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