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Analysis on heat and mass transfer of natural convection flow over a vertical plate with convective surface boundary conditions

Communication Info

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Abstract

This study investigates heat and mass transfer in natural convection flow over a vertical plate with convective boundary conditions, using boundary-layer equations for non-Newtonian fluids [1–3]. The coupled nonlinear partial differential equations [4] are transformed into nonlinear ordinary differential equations through a similarity approach. These equations will be solved using the Runge–Kutta method with the shooting technique, and MAPLE 2024 will be employed to carry out numerical simulations and verify the results.

The analysis incorporates nonlinear thermal radiation and Arrhenius chemical reaction effects on natural convection near the plate. The Boussinesq approximation is applied to represent density variations with temperature and concentration [5]. Validation will involve comparing the results with benchmark studies in the literature. Tables and figures will illustrate the influence of thermal radiation and chemical reaction on skin-friction, heat-transfer, and mass-transfer rates at the plate surface.

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