SOME FASCINATING PROBLEMS IN FLUID DYNAMICS

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1. Unsteady magneto-hydrodynamic (MHD) three-dimensional flow of a chemically reacting and radiating fluid with suction

Abstract: This is a study of the unsteady flow of a viscous, incompressible, electrically conducting, radiating and chemically reacting fluid over a porous plate in the presence of a uniformly applied magnetic field and time-dependent suction. The differential approximation for a non-grey gas near equilibrium is invoked to describe the thermal radiation in the energy equation. Asymptotic series expansion about a small parameter ε, is performed for the flow fields. The effects of the various parameters on the velocity, temperature, concentration, skin-friction, Nusselt and Sherwood numbers are presented in graphs and tabulated forms. Our results confirm that the parametric parameter ε should be very much less than the unity for perturbation results to be highly accurate.

2. Heat transfer to unsteady magneto-hydrodynamic (MHD) flow past an infinite moving vertical plate with variable suction

Abstract: This work considers the free convection heat transfer due to the combined action of radiation and a transverse magnetic field with variable suction. We adopt the differential approximation to describe the radiative flux in the energy equation. The governing coupled partial differential equations are linearized on the assumption that the flow variables are linear functions of the Eckert number E_c and analytical closed form solutions are sought approximately for the velocity, temperature, surface skin-friction and the rate of heat transfer assuming an optically thin medium. Results obtained indicate that increasing the plate velocity increases the flow velocity with this increase being more dramatic for higher values of the free convection. These results are in good agreement with earlier results reported in the literature and corrected an omission in some previously reported works.