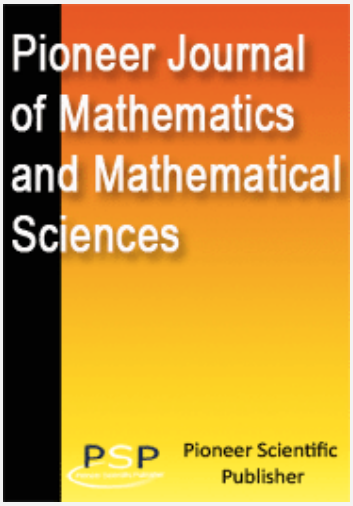
Pioneer Journal of Mathematics and Mathematical Sciences
Volume 8, Issue 1, Pages 21-33 (May 2013)

ISSN: 2230-9829



AN INVESTIGATION OF THE EFFECTS OF BOUNDARY LAYER THICKNESS ON A THIN FILM OF LIQUID FLOW DOWN AN INCLINED PLANE

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Received December 30, 2012

Abstract

The motion of fluid substances may be described by the Navier-Stokes (N-S) equations. The equations arise from the application of Newton's second Law of motion to a fluid. In this paper, N-S equations in two dimensions are considered and applied to an incompressible laminar viscous fluid moving down an inclined plane with net flow. The boundary layer thickness is obtained and its effects on the velocity of the motion at various angles of inclination are examined. In applications such as photographic and magnetic media coating, flow occurs in an inclined position. This makes it necessary to investigate the flow on an inclined plane. Most solutions that have been obtained are over horizontal flat plate. An experimental solution over an inclined plane involving a flat photographic film being pulled up by a processing bath by rollers obtained, boundary layer thickness of the flow where there is no net flow and used a single angle of inclination. In this paper, we examine motion with net flow and varied angle of inclination. Velocity of flow in the boundary layer is obtained in a number of ways and utilized in the momentum integral equation to obtain the boundary layer thickness, a parameter that is used to obtain the flow velocity down the inclined plane.

Keywords and phrases: viscous fluid, incompressible flow, boundary layer thickness, velocity profile.