

New exact solutions corresponding to the first problem of Stokes for Oldroyd-B fluids

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Abstract

The velocity field and the tangential stress corresponding to the flow of an Oldroyd-B fluid over a suddenly moved flat plate are determined by means of the Laplace transform. The solutions that have been obtained, in all agreement with those established using the Fourier transform, reduce to the solutions for a Newtonian fluid as a limiting case. Furthermore, the similar tangential stress for a Maxwell fluid can be also obtained as a limiting case of our solution while the associated velocity field is then determined by a simple integration. Finally, some graphical representations confirm the above assertions.

Keywords: Exact solutions; Oldroyd-B fluid; Infinite plate; First problem of Stokes.

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