Similarity Solution for High Weissenberg Number Flow of Upper-Convected Maxwell Fluid on a Linearly Stretching Sheet NARIMAN ASHRAFI, MEYSAM MOHAMADALI, Department of Mechanical Engineering, Payame Noor University, 19395-3697, Tehran, Iran — High Weissenberg boundary layer flow of viscoelastic fluids on a stretching surface has been studied. The flow is considered to be steady, low inertial, and two-dimensional. Upon proper scaling and by means of an exact similarity transformation, the nonlinear momentum and constitutive equations of each layer transform into the respective system of highly nonlinear and coupled ordinary differential equations. Numerical solutions to the resulting boundary value problem are obtained using an efficient shooting technique in conjunction with a variable stepping method for different values of pressure gradients. It is observed that, unlike the Newtonian flows, in order to maintain a potential flow, normal stresses must inevitably develop. The velocity field and stresses distributions over plate are presented for difference values of pressure gradient and Weissenberg numbers.

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