Abstract

In this dissertation, we will investigate unsteady Couette flows of an Oldroyd-B fluid with non-integer order derivatives. Two infinite, coaxial circular cylinders have an annular region that the fluid fills. Flows result are obtained from the rotation of the outer cylinder about its axis at arbitrary time-dependent velocity while the inner cylinder is held fixed. Expressions for the velocity field and shear stress are obtained using Atangana-Baleanu fractional derivative and the problem is solved by employing the Laplace transform as well as finite Hankel transform. The rotational flows through an infinite cylinder and other results from the literature can be derived as limiting cases of our general solutions. Finally, numerical simulations and graphical illustrations that is obtained by using Mathcad software, are used to investigate how the control of fractional framework affects on the dynamics of fluid.