Problem 4D.4

Unsteady annular flows.

(a) Obtain a solution to the Navier-Stokes equation for the start-up of axial annular flow by a sudden impressed pressure gradient. Check your result against the published solution.\(^\text{(10)}\)

(b) Solve the Navier-Stokes equation for the unsteady tangential flow in an annulus. The fluid is at rest for \( t < 0 \). Starting at \( t = 0 \) the outer cylinder begins rotating with a constant angular velocity to cause laminar flow for \( t > 0 \). Compare your result with the published solution.\(^\text{(11)}\)


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