Tutorial 4

February 9, 2021

Q1 Fluid flows between two parallel plates, a distance h apart. The upper plate moves at velocity, v_0; the lower plate is stationary. For what value of pressure gradient will the shear stress at the lower wall be zeero?

Q2 A thin wire of diameter d is pulled at constant velocity through a pipe of diameter D. If the wire is at the center of the pipe, find the drag per unit length of wire. The fluid filling the space between the rod and the inner pipe wall has density ρ and viscosity μ.

Q3 Apply the law of conservation of mass to an element in a polar coordinate system and obtain the continuity equation for a steady, two-dimensional, incompressible flow.

Q4 Using the Navier–Stokes equations and the continuity equation, obtain an expression for the velocity profile between two flat, parallel plates.