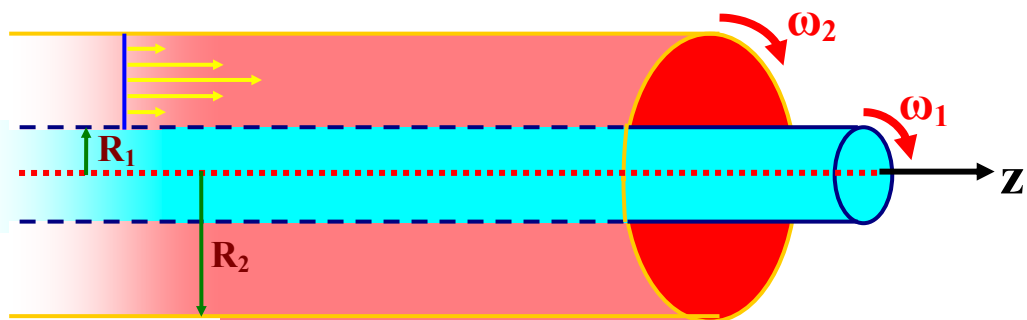


1. Show that the Oseen vortex flow

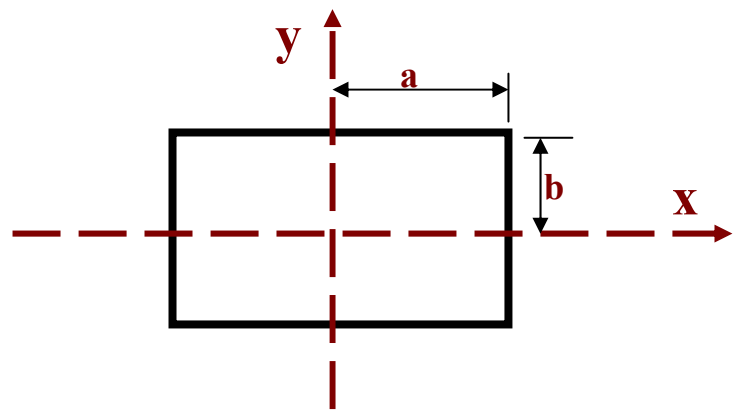
$$v_{\theta} = \frac{\Gamma}{2\pi r} (1 - e^{-r^2/4\nu t})$$

is an exact solution to the Navier-Stokes Equation.

2. Obtain the velocity profiles $v_z(r)$ and $v_{\theta}(r)$ for the helical flow in an annular region. The inner and outer pipes rotate, respectively, with angular velocities of ω_1 and ω_2 , and a constant pressure gradient is imposed on the pipe.



3. Find the fully developed velocity profiles for a duct with rectangular cross section. Assume steady flow with a constant pressure gradient.



4. Determine the unsteady velocity profile, which is developed if the lower plate is set suddenly in motion. The fluid is initially at rest.

