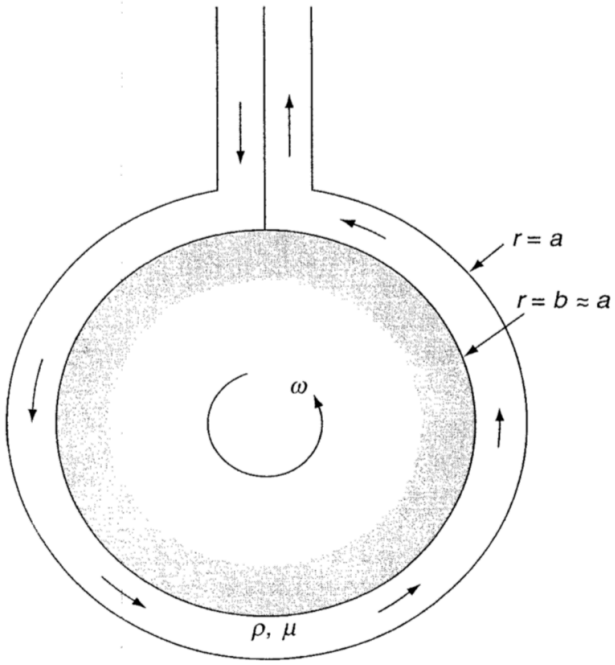
Assignment #1

For steady incompressible flow with negligible viscosity, show that the Navier-Stokes relation (Eq.2-30) reduces to the condition that $\frac{P}{\rho} + \frac{V^2}{2} + gh$ is constant along a streamline of the flow, where h denotes the height of the fluid particle above a horizontal datum. (Derive the Bernoulli relation from the Navier-Stokes equations).

Assignment #2

A Couette pump consists of a rotating inner cylinder and a baffled entrance and exit, as shown in Fig.P3-21. Assuming zero circumferential pressure gradient and $(a - b) \ll a$, derive formulas for the volume flow and pumping power per unit depth. Illustrate for SAE 30 oil at 20°C, with a=10cm, b=9cm and N=600 rpm.



a = Outer radius
b = Inner radius
ω = Angular velocity
H = Height of the cylinder

The velocity distribution is assumed to be linear as $(a - b) \ll a$