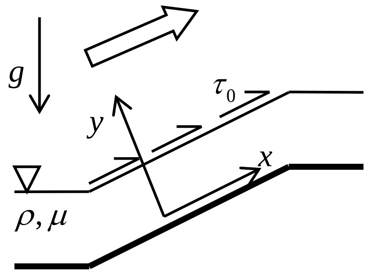
TOTIMERSØVING NR 5 FLUIDMEKANIKK

Utført av: (alle i gruppa)

Oppgave 1

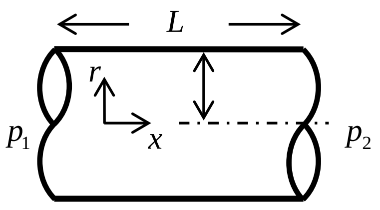


An airflow drives a liquid film along a surface by means of a constant viscous shear τ_0 on the surface of the film. In order to find the velocity u of the liquid, we need two boundary conditions. Which?

Sketch possible velocity profiles so that

- $Q = 0$
- $\tau_w = \tau|_{y=0} = 0$

Oppgave 2

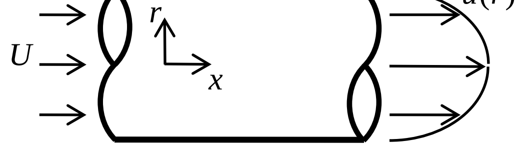


Place a control volume on the interior of a pipe and find the relation between the pressure gradient $\frac{\partial p}{\partial x}\left(=\frac{\Delta p}{L}\right)$ and the wall shear stress τ_w.

Which assumptions must be made?

Does it matter if the flow is laminar or turbulent?

Oppgave 3



Assume that the velocity profile changes from a uniform incoming profile to the well known parabolic profile over a length L_e. Why is it no longer possible to find a simple relation between Δp and τ_w?

Oppgave 4

A perforated pipe has length $L = 100$ m and diameter $d = 5$ cm. 100 liters of water flow out per hour. If we want to model this as a line-sink, what should be the strength m of the sink?

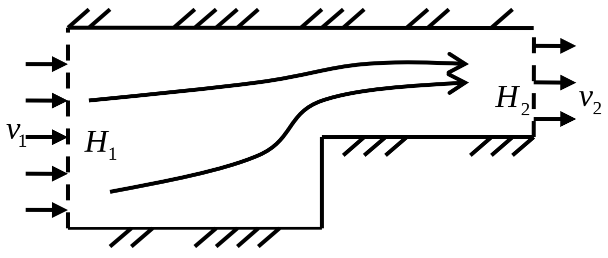
Oppgave 5

Sketch some stream lines from the combination of a sink $-m$ in $(0,0)$, source $+m$ in $(a,0)$ og source $+m$ in $(4a,0)$. (A circle should appear.)

Oppgave 6

Sketch some stream lines from the combination of a vortex $+K$ in $(0,0)$, $+K$ in $(4a,0)$ and $-K$ in $(a,0)$. (A circle should appear.)

Oppgave 7



A 2D-flow over a corner is sought solved numerically by solving the Laplace equation $\nabla^2\psi = 0$. The velocity is constant, $v_1 = 1$ m/s, across the height $H_1 = 1$ m, and at the outlet, $v_2 = 2$ m/s, where $H_2 = 1/2$ m. Find the boundary conditions for ψ at all four surfaces of the domain.