TOTIMERSØVING NR 2 TEP 4105 FLUIDMEKANIKK

Høst 2014
Utført av: (alle i gruppa)

Oppgave 1

How can you find $f(x, y)$ from the expressions

$$\frac{\partial f}{\partial x} = a \ , \ \frac{\partial f}{\partial y} = b \ ?$$

Oppgave 2

$$y_{CP} = -\gamma \sin\theta \frac{I_{xx}}{p_{CG} A} \ (1)$$

$$y_{CP} = -\sin\theta \frac{I_{xx}}{h_{CG} A} \ (2)$$

What is meant with *CG* og *CP*?

How is the y-axis oriented in hydrostatic problems?

When can we use expression (2) in stead of (1)?

Oppgave 3

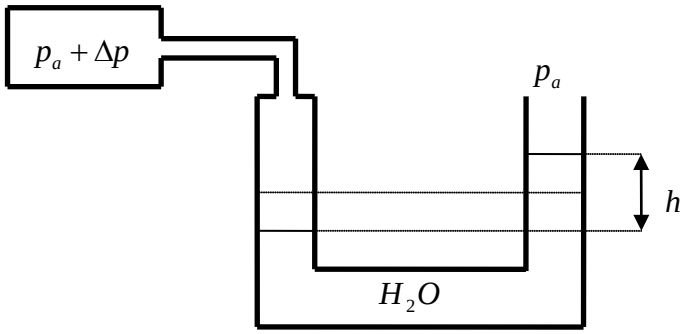
$$0 = -\nabla p + \rho \vec{g}_{eff}$$

In quasi statics (stiff body motion) we can adjust the gravity $\vec{g}$ to become $\vec{g}_{eff}$. In which two cases is this possible and how is it done?

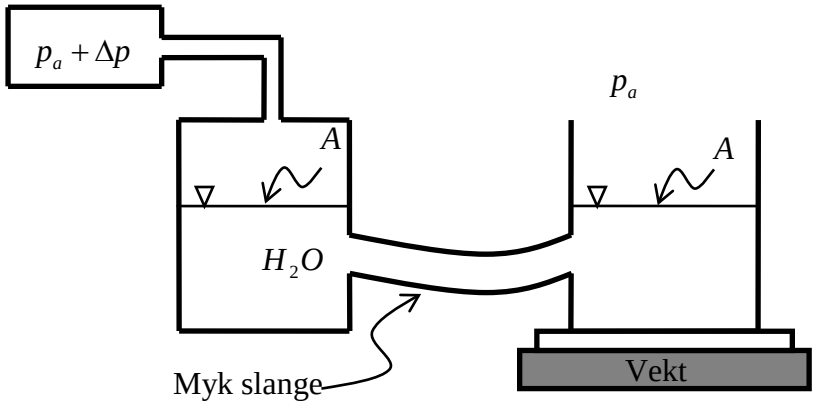
Oppgave 4

We want to measure an overpressure Δp by means of three different methods.

1. Simple tube:
   Estimate the height h at $\Delta p \approx 1\text{Pa}$.

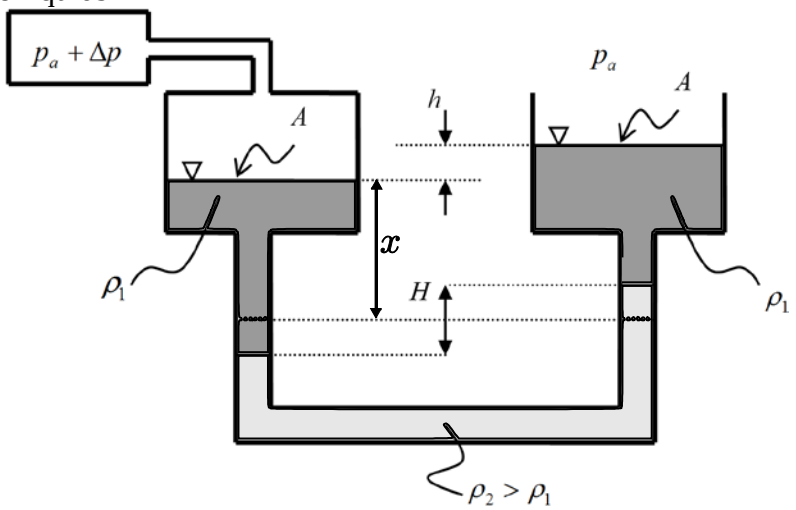


2. With a weight



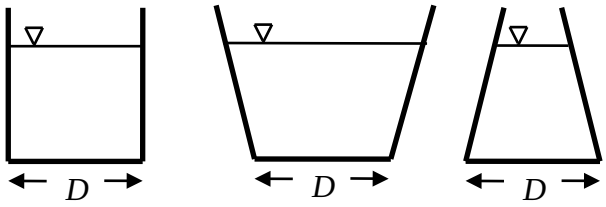
A is the area of the water surface. How many grams will the weight read at $\Delta p \approx 1\text{Pa}$?

3. With two liquids



Assume that the area A is much greater than the area of the connecting pipe so that the height *h* is negligible. Find *H* expressed as a function of the density difference and Δp .

Oppgave 5



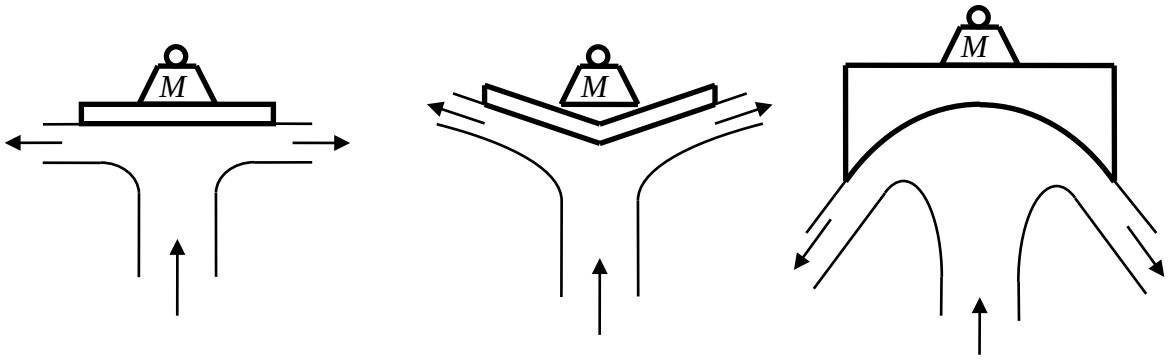
a) The total pressure force acting on the bottom of the three glasses is the same. How can it then be that they contain different amounts of water?

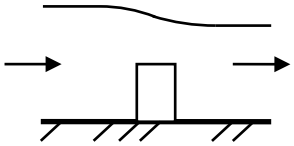
b) The middle container is places on a weight which registers the total mass to 1kg exactly. We then stick an index finger 5 cm down into the water. What mass will the weight now register? You may assume a cylindrical index finger of 2 cm^2 cross-sectional area. Use ρ = 1000kg/m^3, g = 10m/s^2.

Oppgave 6

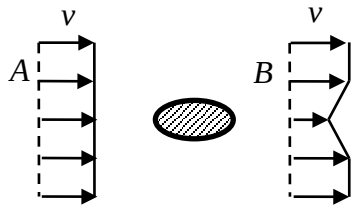
Draw the control-volumes so that the following tasks can be solved as simple as possible:

Find the mass *M* held up by a water jet. Which of the three can hold the largest mass?

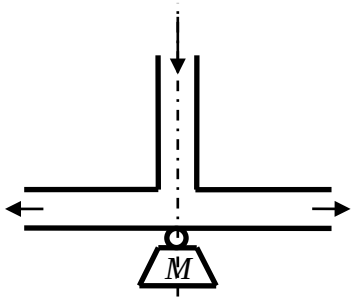




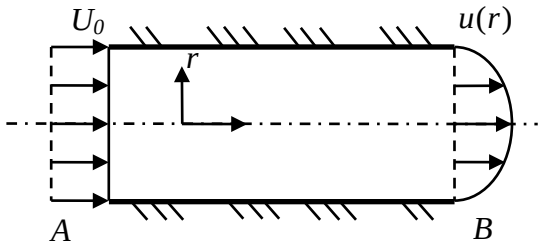
A frictionless flow flows over a submerged structure. The pressure is considered to be hydrostatic. Find the force on the structure.



Behind a pillar of a bridge a wake is formed, described by the velocity distribution given in B. Assume that the pressure in A and B is identical. What is the force acting on the pillar?



Air passes between two circular plates. The pressure becomes lower than in the surroundings so that the lower plate can lift a mass *M*. Find *M*.



A uniform flow enters a pipe. Due to the no-slip condition, the velocity distribution will change to $u(r)$. Given the pressure p_A at *A* and p_B at *B*, find the frictional force on the pipe wall.