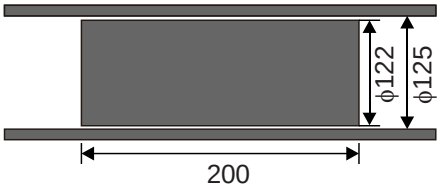
MAE5009: Continuum Mechanics B

Assignment 06: Fluid Statics

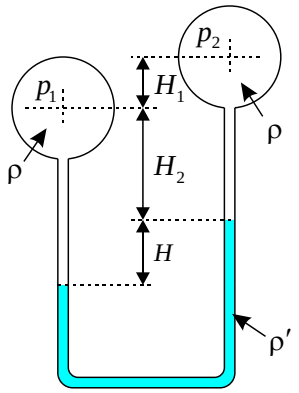
Due December 17, 2021

1. As shown below, a cylinder of diameter 122 mm and length 200 mm is placed inside a concentric long pipe of diameter 125 mm. An oil film is introduced in the gap between the pipe and the cylinder. What force is necessary to move the cylinder at a velocity of 1 m/s? Assume that the kinematic viscosity of oil is 3×10^{-5} m^2/s and the specific gravity is 0.9.

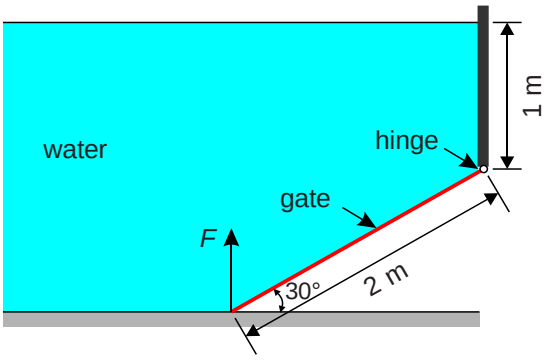


2. What is the water pressure on the sea bottom at a depth of 6500 m? The specific gravity of sea water is assumed to be 1.03.

3. Obtain the pressure difference $p_1 - p_2$:



4. A rectangle gate with width of 3 m is placed under the water, as shown below. The gate is hinged at the top. Determine the force *F* needed to just lift the gate.



5. A circular shape water gate is shown as below, α = 45˚, the water depth *h* = 3.0 m. determine the overall hydrostatic force acting on unit gate width and its direction.