Birzeit University
Mechanical & Mechatronics Engineering Department
Thermal fluid engineering ENMC4411
Homework 2
Chapter 2 CV equations

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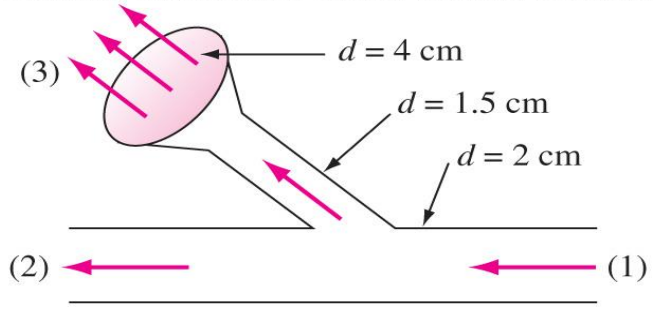
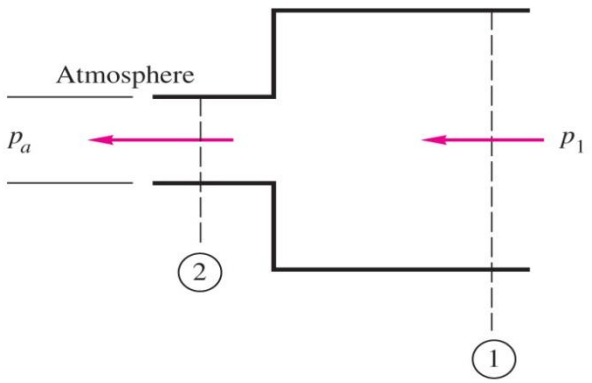
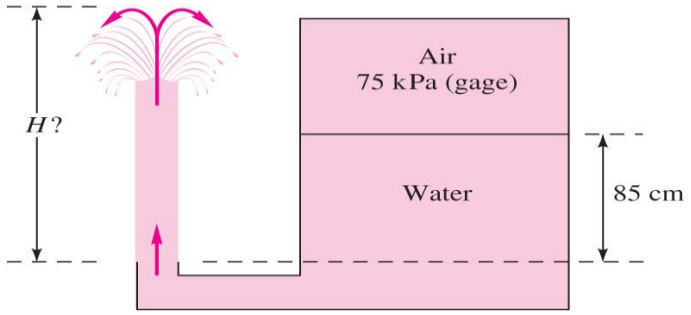
1. Water at 20°C flows through the piping junction in the figure, entering section 1 at 20 gal/min. The average velocity at section 2 is 2.5 m/s. A portion of the flow is diverted through the showerhead, which contains 100 holes of 1-mm diameter. Assuming uniform shower flow, estimate the exit velocity from the showerhead jets. (1 gal = 3,785 liters).



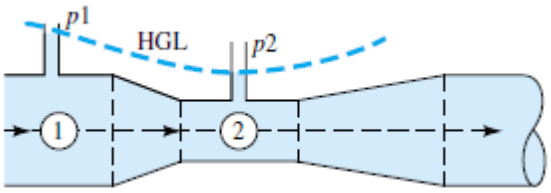
2. A liquid of density ρ flows through the sudden contraction in Fig. P3.42 and exits to the atmosphere. Assume uniform conditions (p1, V1, D1) at section 1 and (p2, V2, D2) at section 2. Find an expression for the force F exerted by the fluid on the contraction.



3. Water at 20 ^{0}C, in the pressurized tank of Fig. P3.117, flows out and creates a vertical jet as shown. Assuming steady frictionless flow, determine the height H to which the jet rises.



4. A constriction in a pipe will cause the velocity to rise and the pressure to fall at section 2 in the throat. The pressure difference is a measure of the flow rate through the pipe. The smoothly necked-down system shown in Fig. E3.23 is called a venturi tube. Find an expression for the mass flux in the tube as a function of the pressure change.



5. When the pump in Fig. P3.130 draws 220 m^3/h of water at 20°C from the reservoir, the total friction head loss is 5 m. The flow discharges through a nozzle to the atmosphere. Estimate the pump power in kW delivered to the water.