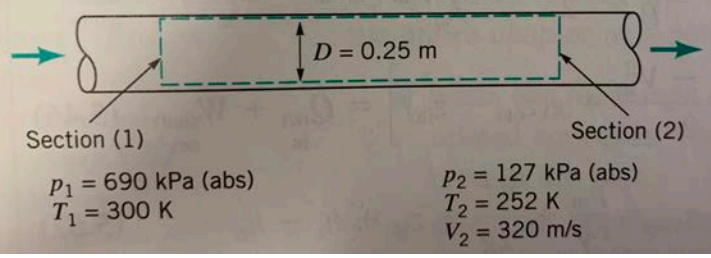
Homework 4 – Problem 5- 6,15,36,40 and 50

Q1) Pick a scene from a film that relates to fluid mechanics. Name the film and describe the scene briefly.

For all questions below make sure to draw your control volume!!!!

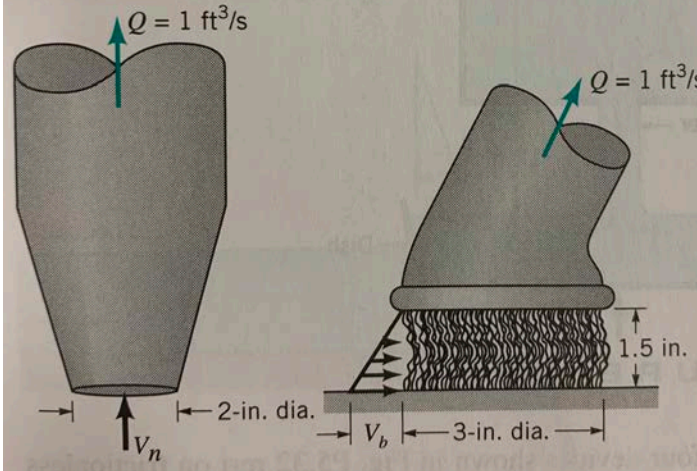
Q2)

5.6 Air flows steadily between two cross sections in a long, straight section of 0.25-m inside-diameter pipe. The static temperature and pressure at each section are indicated in Fig. P5.6. If the average air velocity at section (2) is 320 m/s, determine the average air velocity at section (1).



Q3)

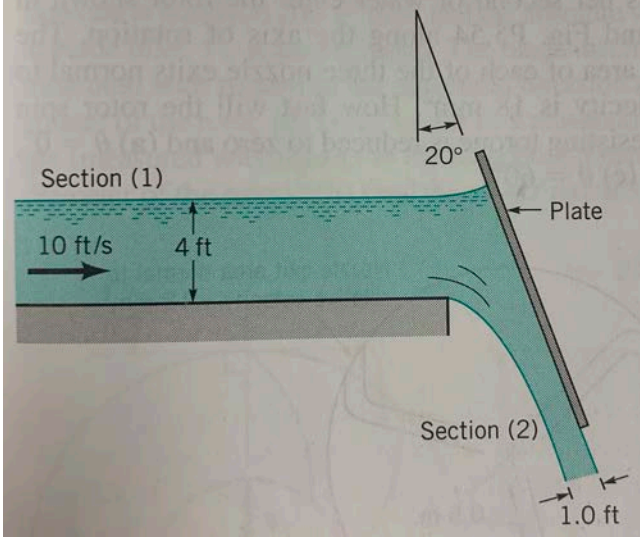
5.14 Various types of attachments can be used with the shop vac shown in **Video V5.2.** Two such attachments are shown in Fig. P5.14—a nozzle and a brush. The flowrate is 1 ft^3/s. **(a)** Determine the average velocity through the nozzle entrance, V_n. **(b)** Assume the air enters the brush attachment in a radial direction all around the brush with a velocity profile that varies linearly from 0 to V_b along the length of the bristles as shown in the figure. Determine the value of V_b.



■ FIGURE P5.14

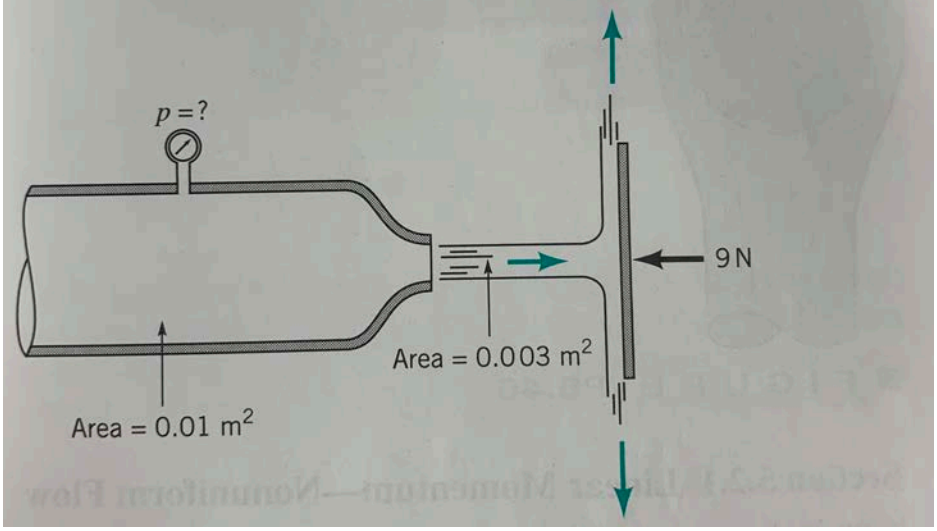
Q4)

5.36 Water flows from a two-dimensional open channel and is diverted by an inclined plate as illustrated in Fig. P5.36. When the velocity at section (1) is 10 ft/s, what horizontal force (per unit width) is required to hold the plate in position? At section (1) the pressure distribution is hydrostatic, and the fluid acts as a free jet at section (2). Neglect friction.



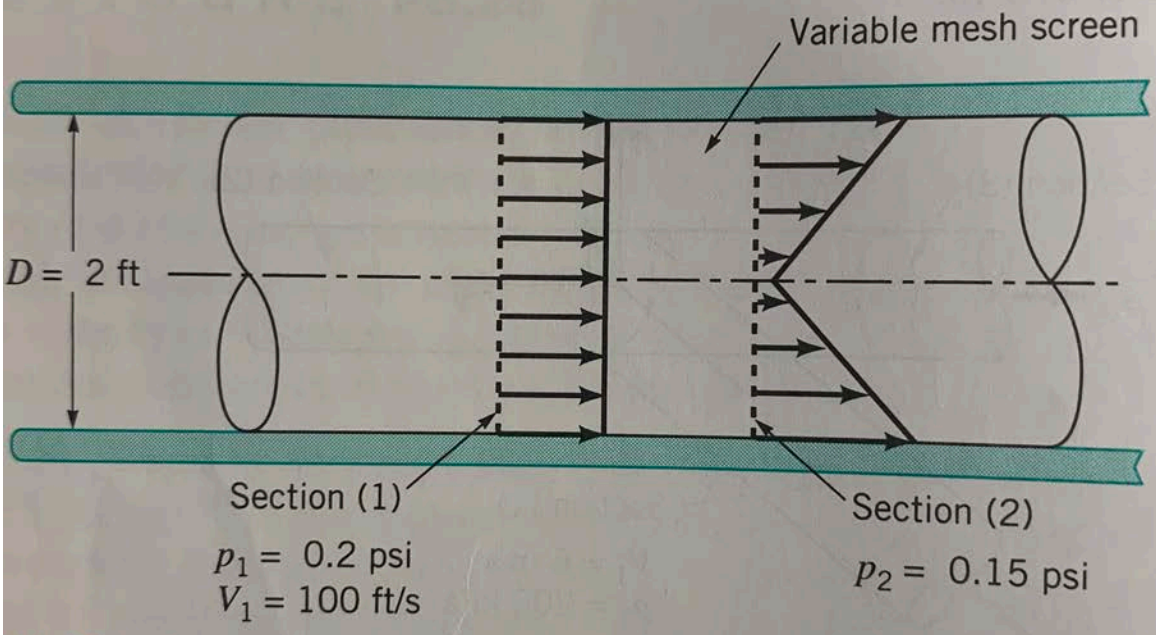
Q5)

5.40 Air flows into the atmosphere from a nozzle and strikes a vertical plate as shown in Fig. P5.40. A horizontal force of 9 N is required to hold the plate in place. Determine the reading on the pressure gage. Assume the flow to be incompressible and frictionless.



Q6)

5.50 A variable mesh screen produces a linear and axisymmetric velocity profile as indicated in Fig. P5.50 in the air flow through a 2-ft-diameter circular cross-sectional duct. The static pressures upstream and downstream of the screen are 0.2 and 0.15 psi and are uniformly distributed over the flow cross-sectional area. Neglecting the force exerted by the duct wall on the flowing air, calculate the screen drag force.



■ FIGURE P5.50