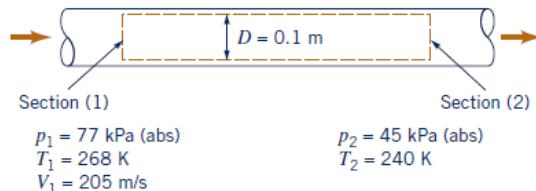


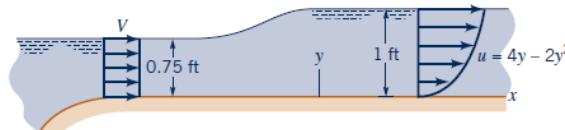
Series 5 (21 March 2025)

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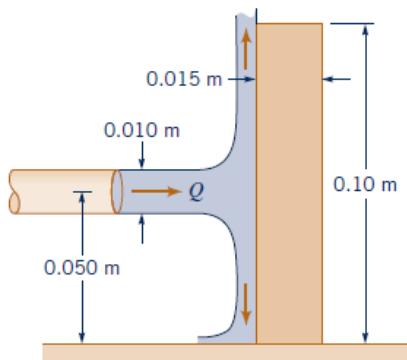
5.10. Air flows steadily between two cross sections in a long, straight section of 0.1-m-inside-diameter pipe. The static temperature and pressure at each section are indicated in Fig. P5.10. If the average air velocity at section (1) is 205 m/s, determine the average air velocity at section (2).

**Figure P5.10**

5.23. As shown in Fig. P5.23, at the entrance to a 1 m wide channel the velocity distribution is uniform with a velocity V . Further downstream the velocity profile is given by $u = 4y - 2y^2$, where u is in m/s and y is in m. Determine the value of V .

**Figure P5.23**

5.36. A 10-mm-diameter jet of water is deflected by a homogeneous rectangular block (15 mm by 200 mm by 100 mm) that weighs 6 N as shown in Fig. P5.36. Determine the minimum volume flowrate needed to tip the block.

**Figure P5.36**

5.41. A free jet of fluid strikes a wedge as shown in Fig. P5.41. Of the total flow, a portion is deflected 30° the remainder is not deflected. The horizontal and vertical components of force needed to hold the wedge stationary are F_H and F_V , respectively. Gravity is negligible, and the fluid speed remains constant. Determine the force ratio, F_H/F_V .

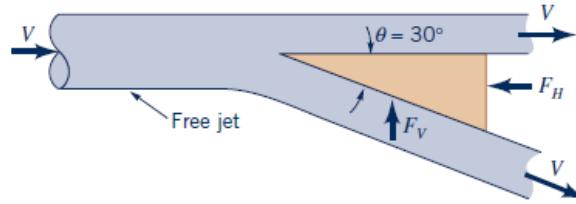


Figure P5.41

5.48. Water is added to the tank shown in Fig. P5.48 through a vertical pipe to maintain a constant (water) level. The tank is placed on a horizontal plane which has a frictionless surface. Determine the horizontal force, F , required to hold the tank stationary. Neglect all losses.

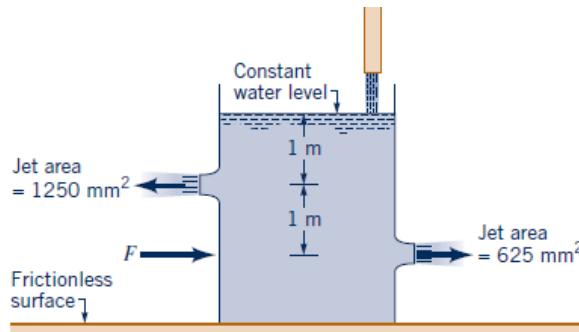


Figure P5.48

5.53. A vertical jet of water leaves a nozzle at a speed of 10 m/s and a diameter of 20 mm. It suspends a plate having a mass of 1.5 kg as indicated in Fig. P5.53. What is the vertical distance h ?

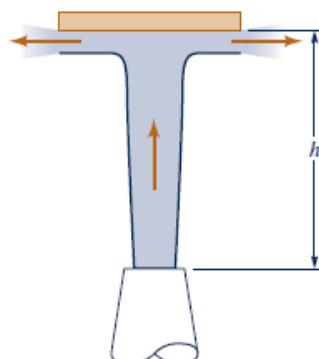


Figure P5.53