

1. The “no-slip” condition means that a fluid “sticks” to a solid surface. This is true for both fixed and moving surfaces. Let two layers of fluid be dragged along by the motion of an upper plate as shown in Fig. 1. The bottom plate is stationary. The top fluid puts a shear stress on the upper plate, and the lower fluid puts a shear stress on the bottom plate. Determine the ratio of these two shear stresses.

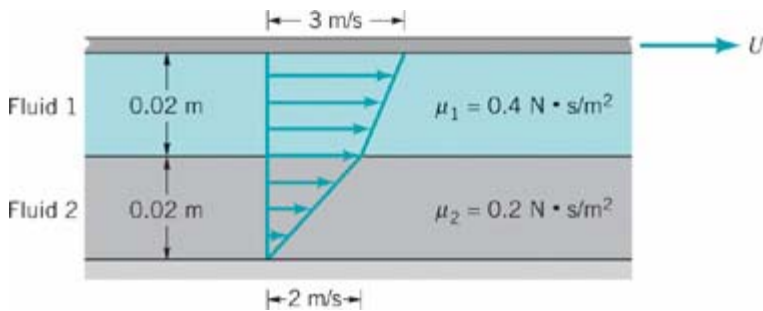


Figure 1 (for Problem 1)

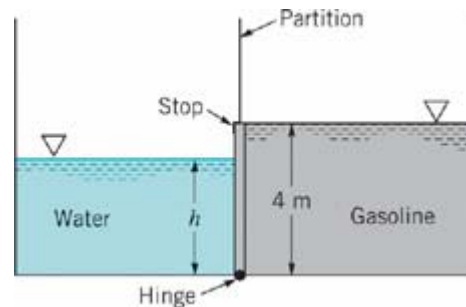


Figure 2 (for Problem 2)

2. An open tank has a vertical partition and on one side contains gasoline with a density $\rho = 700 \text{ kg/m}^3$ at a depth of 4 m, as shown in Fig. 2. A rectangular gate that is 4 m high and 2 m wide and hinged at one end is located in the partition. Water is slowly added to the empty side of the tank. At what depth, h , will the gate start to open?

3. Determine the flowrate through the pipe in Fig. 3.

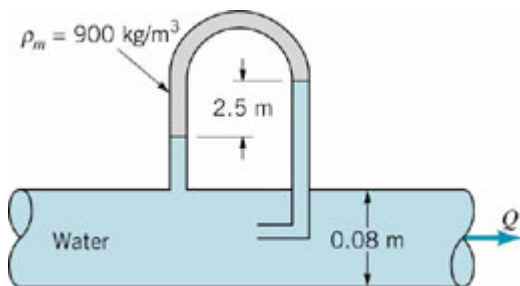


Figure 3 (for Problem 3)

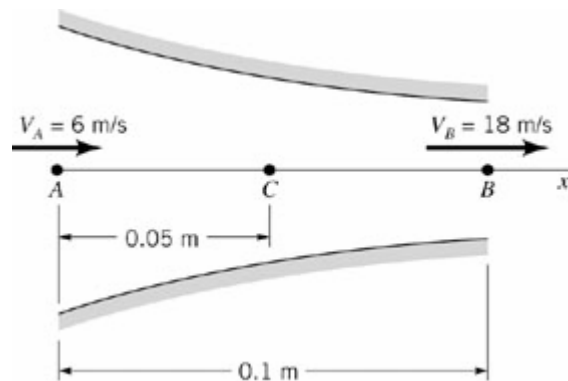


Figure 4 (for Problem 4)

4. The fluid velocity along the x axis shown in Fig. 4 changes from 6 m/s at point A to 18 m/s at point B. It is also known that the velocity is a linear function of distance along the streamline. Determine the acceleration at points A, B, and C. Assume steady flow.