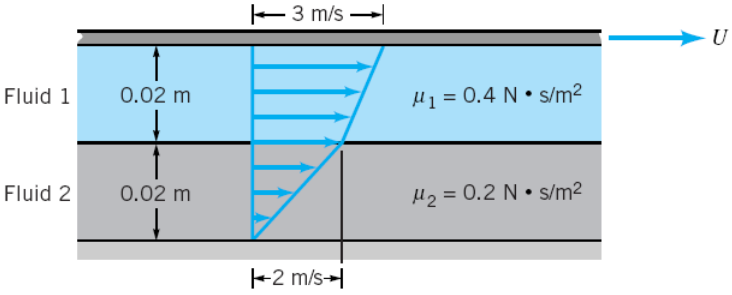
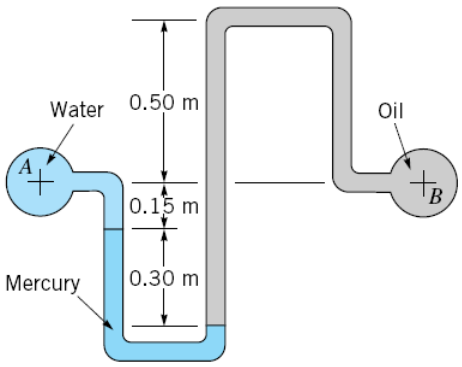
HOMEWORK 1 Assignement date: February 19, 2008 Quiz: February 26, 2008

1.54 As shown in **Video V1.2**, 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. P1.54. 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 botton plate. Determine the ratio of these two shear stresses.



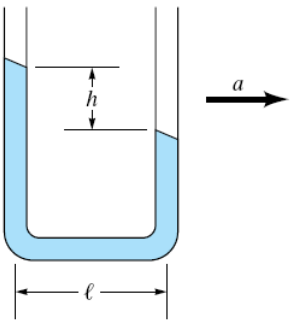
■ FIGURE P1.54

2.31 The mercury manometer of Fig. P2.31 indicates a differential reading of 0.30 m when the pressure in pipe *A* is 30-mm Hg vacuum. Determine the pressure in pipe *B*.



■ FIGURE P2.31

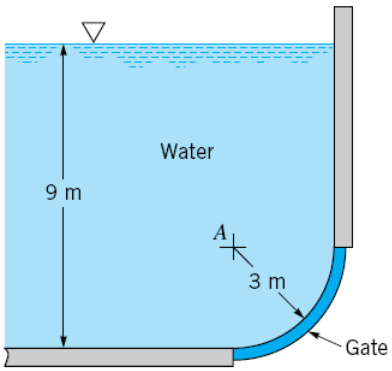
2.97 The open U-tube of Fig. P2.97 is partially filled with a liquid. When this device is accelerated with a horizontal acceleration a, a differential reading h develops between the manometer legs which are spaced a distance ℓ apart. Determine the relationship between a, ℓ, and h.



■ FIGURE P2.97

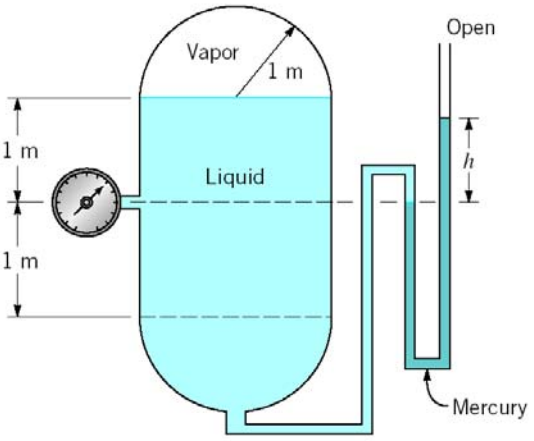
2.58 The rigid gate, *OAB*, of Fig. P2.58 is hinged at *O* and rests against a rigid support at *B*. What minimum horizontal force, *P*, is required to hold the gate closed if its width is 3 m? Neglect the weight of the gate and friction in the hinge. The back of the gate is exposed to the atmosphere.

2.70 A 4-m-long curved gate is located in the side of a reservoir containing water as shown in Fig. P2.70. Determine the magnitude of the horizontal and vertical components of the force of the water on the gate. Will this force pass through point *A*? Explain.

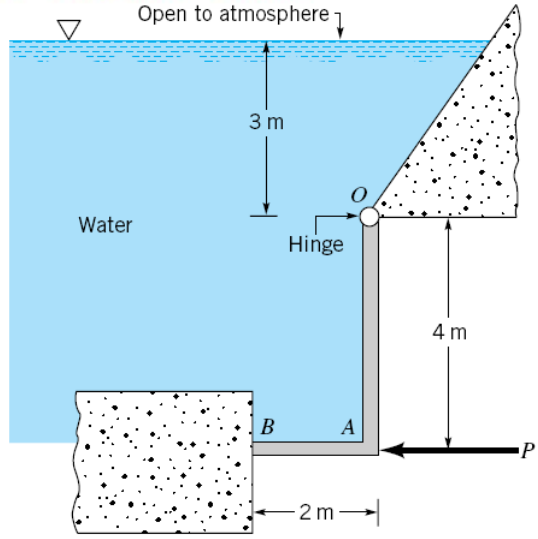


■ FIGURE P2.70

2.35 The cyclindrical tank with hemispherical ends shown in Fig. P2.35 contains a volatile liquid and its vapor. The liquid density is 800 kg/m^3, and its vapor density is negligible. The pressure in the vapor is 120 kPa (abs), and the atmospheric pressure is 101 kPa (abs). Determine: **(a)** the gage pressure reading on the pressure gage; and **(b)** the height, *h*, of the mercury manometer.



■ FIGURE P2.35



■ FIGURE P2.58