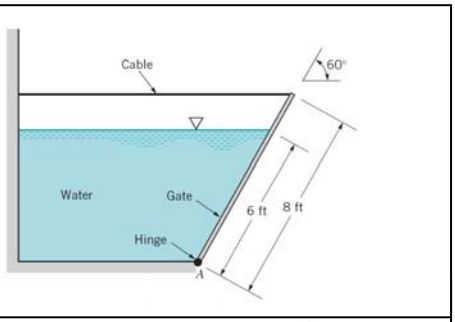
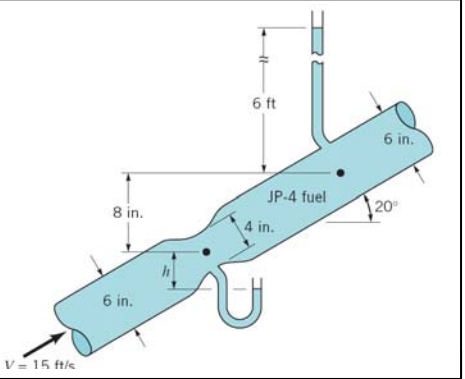
2.52. A homogeneous, 4ft wide and 8ft long rectangular gate weighing 800lbs is held in place by horizontal flexible cable as shown in the Figure. Water acts upon the gate which is hinged at point A. Determine the tension on the cable.

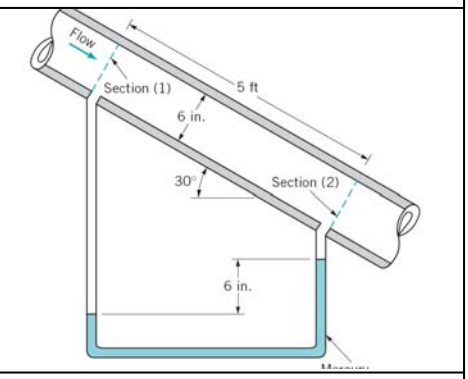


3.68. JP4 fluel (SG=0.77) flows through the Venturi meter shown in Fig with a velocity of 15 ft/s in the 6-in diam pipe. If the visous effecs are negligible, determine the elevation h in the open tube (see fig)



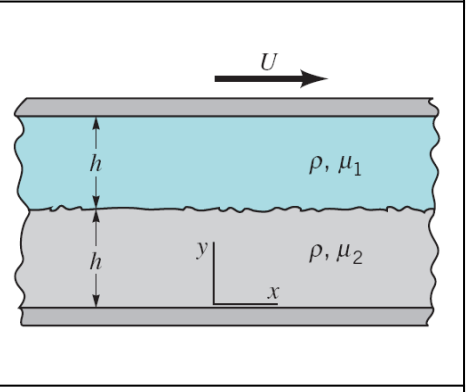
4.14. A velocity field is given by $u=cx^2$ and v=cy2 where c is constant. Determine the x and y components of the acceleration. At what point the acceleration is 0?

5.102 Water flows steadily down the inclined pipe as indicated in the Figure. Determine the following: (a) the difference in pressure p1-p2; (b) the loss between section (1) and (2); (c) the net axial force exerted by the pipe wall on the flowing water between sections (1) and (2).

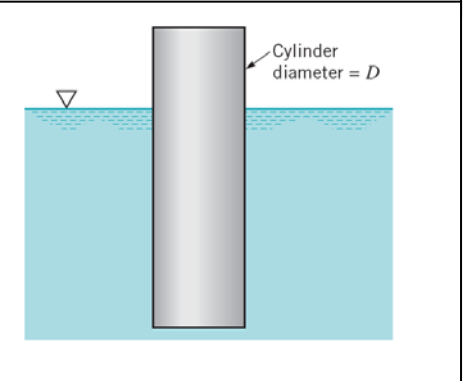


6.34 The stream function for 2D, non-viscous and incompressible flow is given by expression:
$\psi = -2(x-y)$, where stream fuction is ft^2/s and x, y are in ft. Determin if the continuity equation is satisfied. (b) is the flow irrotational (c) determine the pressure gradient in the horizontal direction at a point x=2, y=2.

6.81 Two immiscible, incompressible viscous fluids having the same densities but different viscosities are contained between two parallel plates. The bottom plate is fixed and the top one is moving with the velocity of U. Determine the velocity at the interface in terms of U, μ_1 and μ_2.

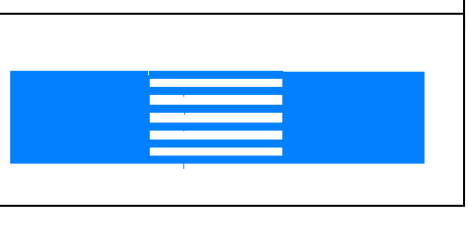


7.20 A cylinder with a diameter D floats upright in a liquid as shown in the Figure. When the cylinder is displaced slightly along its vertical axis it starts to ascillate with the frequency w. Write the frequency dependence as a function of the diameter D and mass m pf the cylinder and specific weight of the liquid g using dimensional analysis approach.



9.10 A viscous fluid flows past a flat plate such that the boundary layer thickness at a distance 1.3m from the leading edge is 12 mm. Determine the boundary layer thickness at a distances 0.2, 2.0, and 20m from the leading edge. Assume laminar flow.

MF1. Calculate the flow resistance of the microfluidic circuit shown in the figure. The height of all channels – 50um, the width of large channels 1mm, small channels 100 um.



MF2 Experimenting with an H-cell (channel height - 50um, channel width - 200um, contact zone length 2mm) at a flow rate of 20ul/min you have found that your component has diffused 100 um into another liquid. Estimate the diffusion coefficient. Assuming you solution has properties of water estimate the diameter of the molecules your component is composed from.