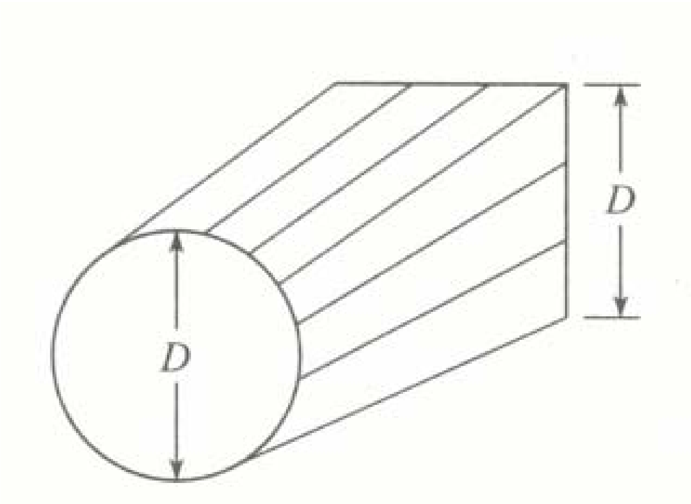
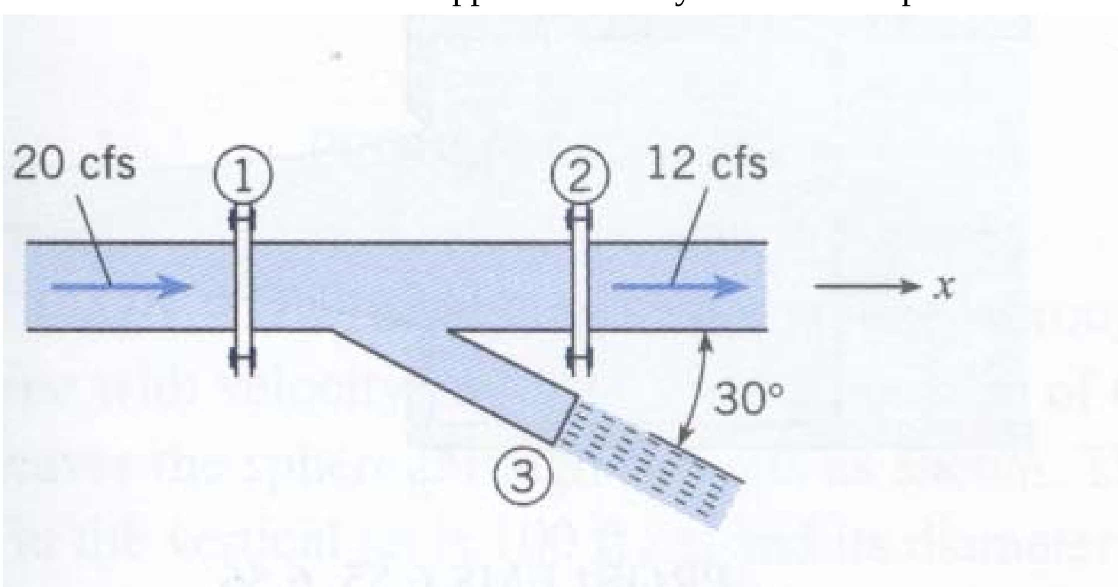
057:20 **TEST # 2** **Fall 2004**

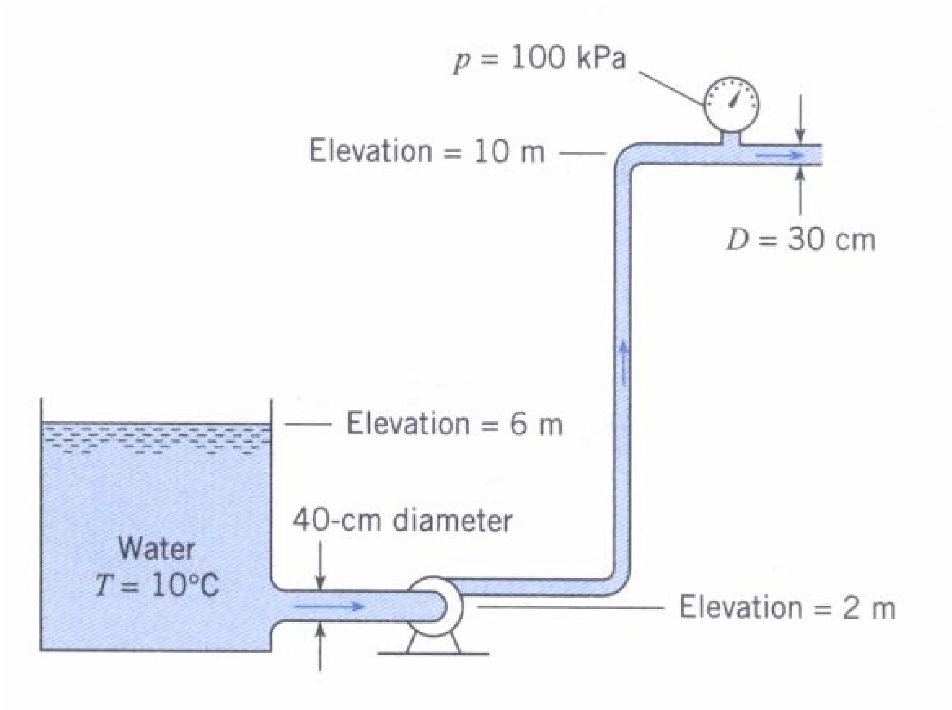
1. A circular duct of diameter D is connected to a square duct with sides of length D, as shown. Air flows in the circular duct at $100\ ft/\sec$. There is no elevation difference between the circular and the square section. Assume the flow is steady, inviscid, irrotational and incompressible. The specific weight of air is $0.075\ lbf/ft^3$. Find the pressure change between the circular and square section.



2. For this wye fitting, which lies in a horizontal plane, the cross-sectional areas at sections 1, 2, and 3 are $1\ ft^2$, $1\ ft^2$, and $0.25\ ft^2$, respectively. At these same respective sections the pressures are $1000\ psfg$, $900\ psfg$, and $0\ psfg$, and the water discharges are $20 cfs$ to the right, $12 cfs$ to the right, and $8 cfs$. What x component of force would have to be applied to the wye to hold it in place?



3. Water is flowing at a rate of $0.25 m^3/s$, and it is that $h_L = 2V^2/2g$ from the reservoir to the gage, where V is the velocity in the 30-cm pipe. What power must the pump supply?



4. A drying tower at an industrial site is $10m$ in diameter. The air inside the tower has a kinematic viscosity of $4\times10^{-5}\, m^2/s$ and enters at $10\, m/s$. A $1/10$ scale model of this tower is fabricated to operate with water that has a kinematic viscosity of $10^{-6}\, m^2/s$. What should the entry velocity of the water be to achieve Reynolds-number scaling?