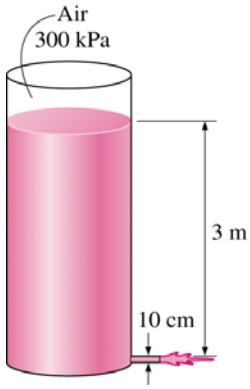
10.303 & 14.301 Fluid Mechanics

Homework Assignment #7 Fall 2006

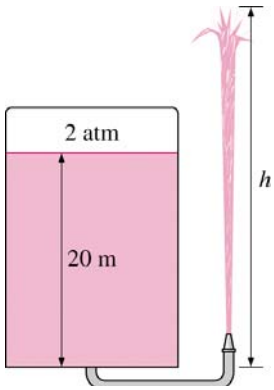
The Bernoulli Equation

1. A pressurized tank of water has a 10 cm diameter orifice at the bottom, where water discharges to the atmosphere. The water level is 3 m above the outlet. The air pressure above the water level within the closed tank is maintained at 300 kPa (absolute). The atmospheric pressure outside the tank is 100 kPa. Neglecting frictional effects, determine the initial discharge rate of water from the tank.

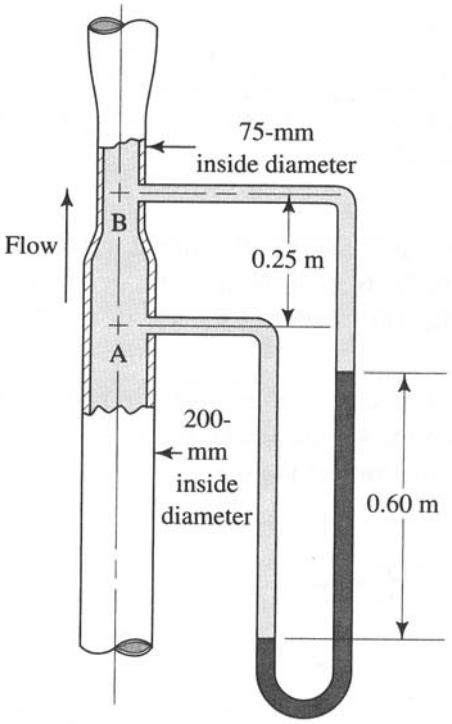


2. The water level in a tank is 20 m above the ground. A hose is connected to the bottom of the tank and a nozzle at the end of the hose points straight up as shown in the sketch. The air in the tank above the water is pressurized to 2 atm gage.

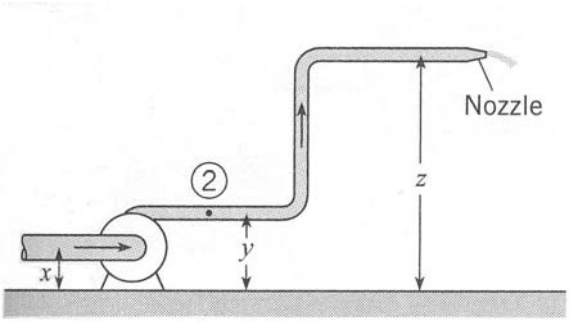
Estimate the maximum height to which the water stream could rise. Explain your assumptions.



3. The Venturi meter shown carries oil (sg = 0.90). The specific gravity of the gage fluid in the manometer is 1.40. With the conditions shown, calculate the volume flow rate of the oil in m^3/s.



4. For the system shown, the discharge of water is 0.20 m^3/s, x = 1 m, y = 2 m, z = 7 m, and the pipe diameter is 30 cm. Neglecting losses, what is the pressure head at point 2 if the jet from the nozzle is 15 cm in diameter?



5. Water flows through the branching pipe shown. If viscous effects are negligible, determine the pressure at Section 2 and at Section 3.