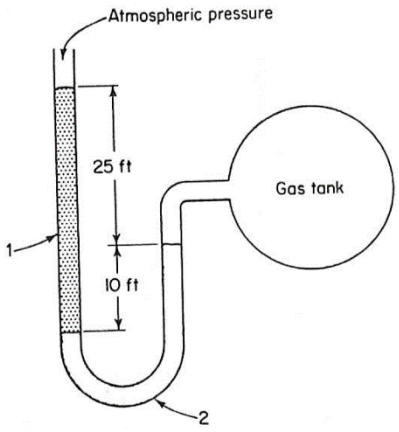
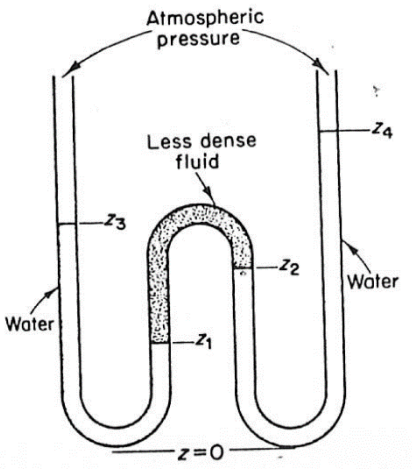
ABE 307, Fall 2017
Homework 2
Assigned: 09/01/17
Due: 09/08/17
Total Points : 50

1. If the density of fluid 1 is 62.4 lb_m/ft^3 and the density of fluid 2 is 136.8 lb_m/ft^3, determine the gas pressure in the tank shown in Fig below. Assume that the density of the gas in the tank is negligible compared to the two manometer fluids. (10)



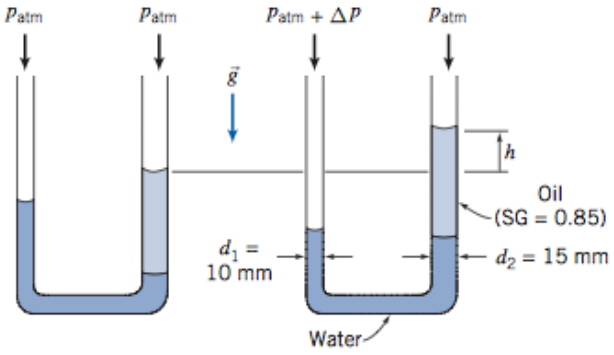
2. Qualitatively discuss the consequences of using the manometer shown in Problem 2 at a height close to interface of troposphere and stratosphere. (5)

3. For fluids with a density close to, but less than, that of water, the specific gravity is best determined in the system shown in Fig below. Derive an expression for specific gravity (γ) in terms of z_1, z_2, z_3 and z_4. (10)



4. A student wishes to design a manometer with better sensitivity than a water-filled U-tube of constant diameter. The student's concept involves using tubes with different diameters and two liquids, as shown in the figure below. Evaluate the deflection ***h*** of this manometer if the applied pressure difference ΔP = 250N/m^2. Determine the sensitivity of this manometer. Plot the manometer sensitivity as a function of d_2/d_1. (15)

   Note : Sensitivity is defined as $s = \frac{h}{\Delta h_e}$ where, Δh_e is the equivalent deflection of water for ΔP calculated as $\Delta h_e = \frac{\Delta P}{\rho_w g}$ where ρ_w is the density of water.



5. A wooden cylinder is floating in water. The length of the cylinder is 50 cm and diameter is 12 cm. The density of wood is 0.38 gm/cc. At the equilibrium position the cylinder makes 30^O with the surface of water. Find the length of cylinder submerged in water (both the longer and shorter side – when you imagine a 2D picture of the submerged cylinder, there is a shorter length and a longer length submerged in water). (10)