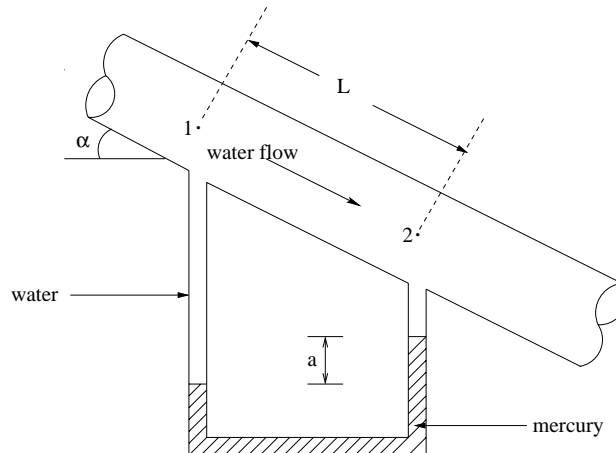


MAE 103 Assignment 2: Due Thursday, April 18, 2002

A. R. Karagozian

(Please turn in at the end of the class session at 10 am)

1. Consider the sketch below in which water flows downward in a pipe at an angle α . The pressure change between points 1 and 2, $p_1 - p_2$, is partly due to gravity and partly due to the flow in the pipe.



A mercury manometer is used to help to measure pressure change, as shown.

- a.) Write down the expression for the pressure change $p_1 - p_2$ in this pipe. Your expression should include the gravitational acceleration g , the densities of water and mercury, the difference in mercury elevation a , the distance between the points 1 and 2, L , and α . **HINT:** Look at successive pressure differences between point 1 and the interface between the water and mercury, between the two water-mercury interfaces, and between point 2 and the water-mercury interface.
 - b.) Identify in problem 1a.) the component of $p_1 - p_2$ arising from flow in the pipe and the component arising from the elevation difference between points 1 and 2. Which component does the mercury manometer actually measure?
 - c.) If $\alpha = 45^\circ$, $a = 6$ in., and $L = 5$ ft., what is the total pressure change $p_1 - p_2$ in the pipe? Give your answer in units of lbf/in^2 . How much of this change is due to the elevation difference (gravity) between points 1 and 2 and how much is due to the flow?
2. Problem 2.20 in Munson, et al.'s text.
 3. Problem 2.24 in Munson, et al.'s text.
 4. Problem 2.28 in Munson, et al.'s text.
 5. Problem 2.45 in Munson, et al.'s text.
 6. Problem 2.50 in Munson, et al.'s text.
 7. Problem 2.61 in Munson, et al.'s text.