

**College of Engineering and Technology**  
**Mechanical Engineering Department**  
**Fluid Mechanics (ME 361)**



**Sheet 4**  
**Losses in Pipes**

1- Water flow in constant diameter pipe with the following conditions measured:

**At section (a):**  $p_a = 223.39$  KPa and  $z_a = 17.3$  m.

**At section (b):**  $p_b = 204.774$  KPa and  $z_b = 20.8$  m.

Is the flow from (a) to (b) or from (b) to (a)? Explain.

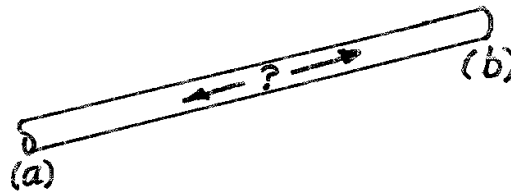


Figure 1

2- The pump shown in figure 2 adds 25 kW to the water and causes a flow rate of  $0.04$   $m^3/s$ . Determine the flow rate expected if the pump is removed from the system. Assume  $f = 0.016$  for both cases and neglect minor losses.

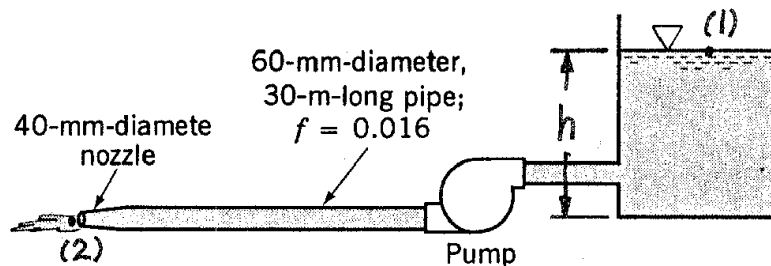


Figure 2

- 3- Water flows from the basement to the second floor through the 20 mm-diameter copper pipe ( $\epsilon = 0.0015 \text{ mm}$ ) at a rate of  $0.75 \text{ L/s}$  and exits through a faucet of diameter  $13 \text{ mm}$ , as shown in figure 3. Determine the pressure at point 1. If  $C$  of elbow is  $1.5$  and  $C$  of valve is  $10$ .

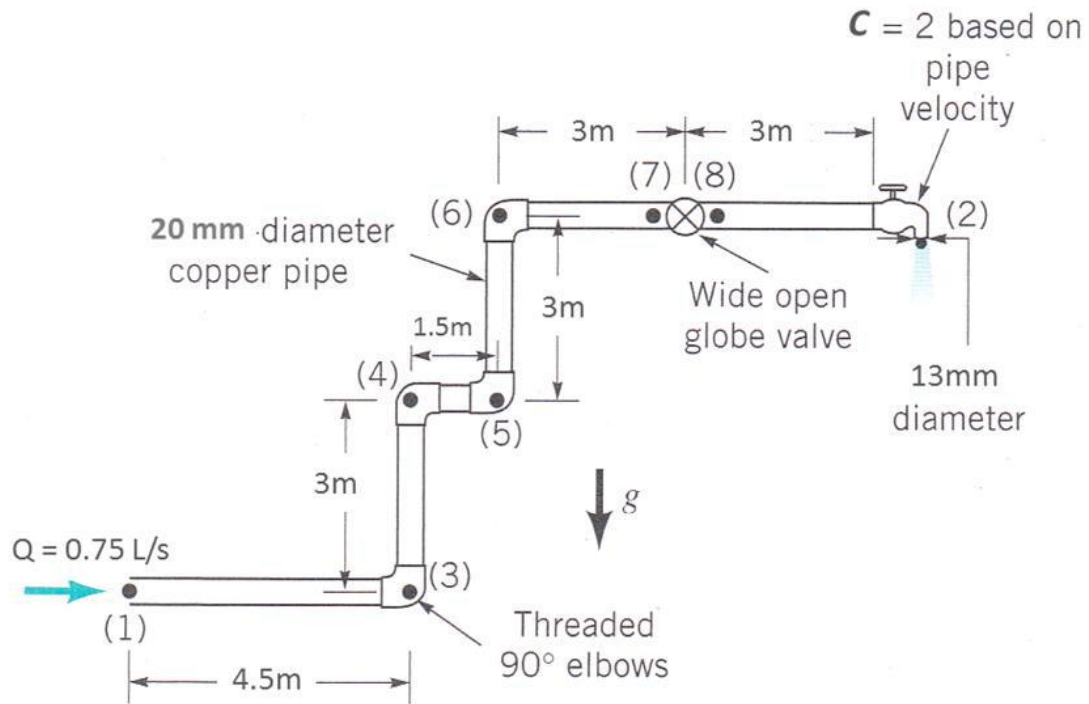


Figure 3