

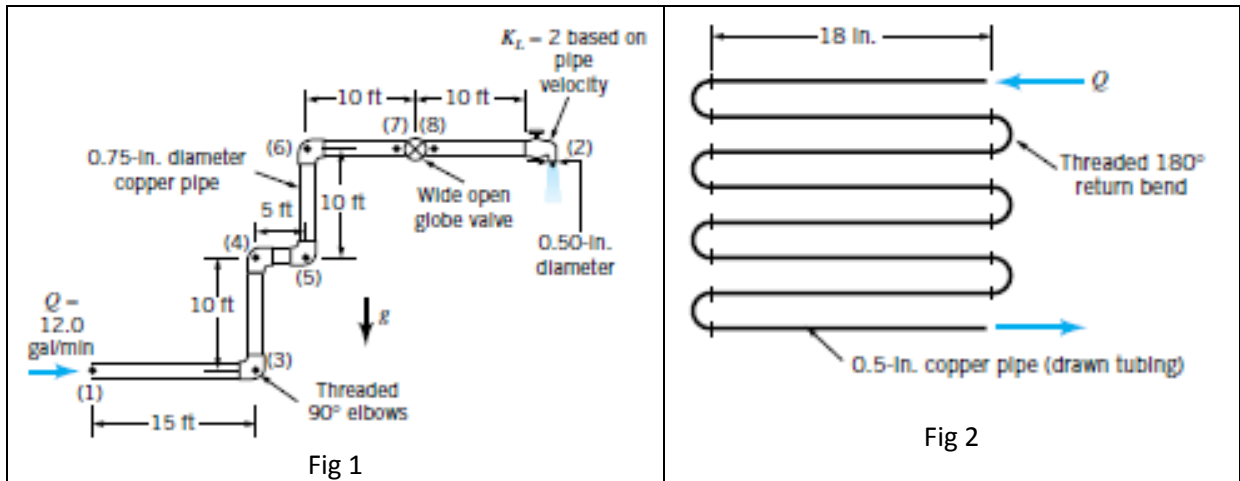
به نام خدا

تکالیف سری دوم سیالات ۲

1. Water at 60°F flows from the basement to the second floor through the 0.75-in. (0.0625-ft)-diameter copper pipe (a drawn tubing) at a rate of $Q=12.0\text{gal/min}=0.0267\text{ft}^3/\text{s}$ and exits through a faucet of diameter 0.50 in. as shown in Fig. 1. Determine the pressure at point (1) if: (a) all losses are neglected, (b) the only losses included are major losses, or (c) all losses are included.

برای قسمت (C) خطوط هیدرولیکی و انرژی را رسم کنید.

2. Water at 40°F flows through the coils of the heat exchanger as shown in Fig. 2 at a rate of 0.9gal/min. Determine the pressure drop between the inlet and outlet of the horizontal device.



3. From the Law of logarithmic, show that for a pipe of radius R , with centre velocity U ,

$$\frac{U - u}{V^*} = 2.5 \ln \left(\frac{R}{y} \right)$$

By integrating the equation for the Law of the Wall show that the flow rate in a circular pipe is given by,

$$Q = \pi R^2 V^* \left(1.75 + 2.5 \ln \frac{V^* R}{\nu} \right)$$

Using the results from questions 1&2, show that, in turbulent flow, the mean velocity in a pipe, u_m , and the maximum velocity, U , are related by:

$$u_m = U - 3.75V^*$$

The following integrals will be useful

$$\int \ln x = x(\ln x - 1)$$

$$\int x \ln x = \frac{x^2}{2}(\ln x - \frac{1}{2})$$