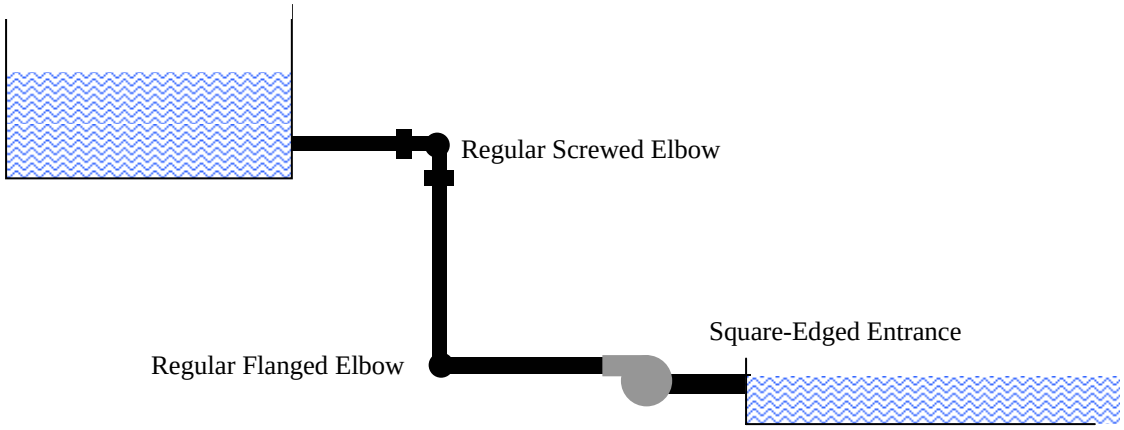
ME 1065 – HW 4
Due 10/15/08

1. Water is to be drawn from a ground-level reservoir to an overhead (10 m) tank that measures 1.5 m long, 1.5 m wide, and 1.2 m high. The tank and reservoir are connected by 40 m of 25 mm diameter galvanized iron pipe. The pump efficiency is 70%.

   a. Determine the power (in Watts) to be supplied to the pump to fill the tank in one hour.
   b. If the pump in part (a) is replaced with a larger pump with a 50% higher power input, how long will it take to fill the tank?
   c. With the same pump as in part (1), find the time required to fill the tank if the pipe is replaced with 40 mm diameter galvanized iron pipe.



2. (a) Do the head flow data shown in Figure 3 of the handout somewhat appear to follow the similarity laws as expressed by the following equations (with $\omega_1 = \omega_2$):

$$\frac{Q_1}{Q_2} = \frac{D_1^3}{D_2^3} \quad \text{and} \quad \frac{h_1}{h_2} = \frac{D_1^2}{D_2^2}$$

   Explain.

   (b) From what dimensionless coefficients can these equations be derived?

3. A 37-cm-diameter centrifugal pump, running at 2140 rev/min with water at 20ºC produces the following performance data:

Q, m^3/s	0.00	0.05	0.10	0.15	0.20	0.25	0.30
H, m	105	104	102	100	95	85	67
P, kW	100	115	135	171	202	228	249

   a. Determine the best efficiency point.
   b. Plot C_H versus C_Q.
   c. If we want to use this same pump family to deliver 7000 gal/min of kerosene at 20ºC at an input power of 400 kW, what pump speed (in rev/min) and impeller size (in cm) are needed?