

## ME 120 Homework 5

Due 08 March 2016

For the experimental pump data given below:

Q Flow Rate (m <sup>3</sup> /s)	P <sub>T</sub> Total Pressure (kPa)	P <sub>IN</sub> Shaft power (kW)
0.0000	504.82	1.190
0.0004	481.50	1.318
0.0008	476.70	1.573
0.0012	471.50	1.828
0.0017	461.00	2.083
0.0021	447.20	2.295
0.0025	426.80	2.465
0.0029	401.40	2.635
0.0033	367.50	2.763
0.0037	326.80	2.890
0.0042	278.61	2.975

1. For the data given, generate plots of the head (meters) versus flow rate (L/min) and pump efficiency (%) versus flow rate (L/min). Make sure your plot axes are labeled.
2. For each plot, generate an appropriate curve fit and report its equation and coefficient of determination (R<sup>2</sup>).

### HELPFUL HINTS

1. The pressure of a fluid can be related to its height through the equation,  $P = \rho gH$  where P is the pressure,  $\rho$  is the density of the fluid, g is the standard acceleration due to gravity and H is the height of the fluid.
2. The pump efficiency ( $\eta$ ) can be calculated by dividing the water power,  $P_W$ , [the total pressure head,  $P_t$  (in Pa) multiplied by the volumetric flow rate,  $Q$ , (in m<sup>3</sup>/s)] by the pump shaft power,  $P_{IN}$ :

$$\eta_{PUMP} = \frac{P_W}{P_{IN}} = \frac{P_T \times Q}{P_{IN}}$$