# ME430 Senior Laboratory 1 – HW3

## Calibration and Regression

## Calibration

A pressure transducer was calibrated by connecting the transducer and an inclined manometer. The manometer was used as a calibration standard with units of inches of water. The transducer had an electrical output in units of volts. Using the table below:

|  |  |
| --- | --- |
| **Height of Water [in\_water]** | **Voltage from Sensor [V]** |
| 2.81 | 1.984 |
| 16.00 | 7.012 |
| 8.52 | 3.954 |
| 11.95 | 5.624 |
| 17.53 | 7.809 |
| 6.37 | 3.767 |
| 2.98 | 2.436 |
| 4.31 | 2.360 |
| 19.20 | 7.756 |
| 14.63 | 5.912 |
| 11.14 | 5.442 |
| 14.83 | 5.912 |
| 17.50 | 7.894 |
| 8.70 | 4.523 |

1. Place the data in vector-matrix format for least squares regression to a linear model   
   y = β0 + β1\*x. Determine the regression coefficients β0 and β1.
2. Calculate confidence intervals for the estimates of β0 and β1. Use a confidence level of 95%.
3. On a single plot of Voltage vs. in\_water, show:
   1. the original data points
   2. the linear prediction
   3. the prediction interval for each Voltage at the data points of in\_water.

## Regression

1. Calculate the sensitivity of the transducer.
2. You are using a DMM to measure the sensor voltage. The 95% error on the meter is 0.05 V. You measure a voltage of 9.832 volts. Using the error on the voltmeter, and confidence interval estimates for β0 and β1 determine:
   1. The nominal pressure (in\_water)
   2. The 95% error in your nominal pressure (in\_water)
3. Make a plot showing error (95% confidence) for in\_water vs. measured voltage for V = 0-20V.