

## ME 120

## Homework 5

Use the data  $(x_i, y_i)$  to the right for questions 1 to 4. Copy all of your answers in a single word-processing document (in addition to your solution to question 5), print that document and turn it in at the beginning of class on the due date. Also include a printed copy of your Excel spreadsheet. Perform the calculations in Excel using formulas that you enter by hand. You can use the built-in Excel tools for linear regression to check your work, but the calculations in curve fit should be carried out using a table and formulas that you enter.

<b>x</b> <b>(time)</b>	<b>y</b> <b>(velocity)</b>
10	26
25	52
33	72
42	90
52	100
65	129

- Using Excel, create a scatter plot of velocity versus time. Make a copy of the graph in your word-processing document.
- In your Excel sheet, compute the terms below.
  - $\sum x_i$
  - $\sum y_i$
  - $\sum x_i y_i$
  - $\sum x_i \sum y_i$
  - $(\sum x_i)^2$
  - $\sum x_i^2$
- Using the values from problem 2, above, what are the slope ( $m$ ) and intercept ( $b$ ) of the least squares line fit to the velocity versus time data? Substitute the  $m$  and  $b$  values you obtain into the equation  $\hat{y}_i = mx_i + b$  where the  $x_i$  and  $y_i$  values are the original data. In other words, extend the data table in your spreadsheet so that it has columns for  $x_i$ ,  $y_i$ , and  $\hat{y}_i$ .
- Using the intermediate results from problem 2 and problem 3, what is the  $R^2$  value for the linear curve fit of the velocity versus time data.
- The two built-in Arduino functions `setup` and `loop` are passed no arguments and return no arguments and so are declared as `void setup()` and `void loop()`. For a general case, what is the syntax of a user-defined function's declaration?