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.

x (time)	y (velocity)
10	27
25	52
32	74
40	91
52	101
65	128

1. Using Excel, create a scatter plot of velocity versus time. Make a copy of the graph in your word-processing document.
2. In your Excel sheet, compute the terms below.
    a. $\sum x_i$
    b. $\sum y_i$
    c. $\sum(x_i\, y_i)$
    d. $\sum x_i \sum y_i$
    e. $(\sum x_i)^2$
    f. $\sum x_i^2$
3. 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 $\hat{y}_i$.
4. 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.
5. 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?