The Body Mass Index is another measure of healthy weight for individuals. It is computed as BMI $= \frac{W}{h^2} * 703$ where height is given in inches and weight in pounds. The guidelines indicate that a person with BMI in $[18.5, 25)$ is considered to be in the normal range. We will further make the assumption that BMI in the lower part of this range, i.e. $[18.5, 21)$ to be the ideal range.

The Excel Spreadsheet wk2.5_HeightWeightData.xlsx contains the height and weight data for both Males and Females in both of these BMI ranges. [The data is a subset of the data reported in *Journal of Statistics Education* Volume 11, Number 2 (2003), www.amstat.org/publications/jse/v11n2/datasets.heinz.html]

1. Make scatter plots of the two different data sets for Males and Females with BMI in [18.5, 21).

2. By looking at the scatter plots, what type of simple model would you expect to fit the data? Use the trendline option to fit this simple model to the data. [Include the equation and R^2 value on the graph.]

3. In class, we derived the following equation as a possible model for the ideal weight of an adult with height h.

$$W = k_0 + k_2 h^2 + k_3 h^3$$

(a). Use Excel Solver and the Least Squares Criterion to fit this model to the two different data sets for Males and Females with BMI in [18.5, 21).

(b). Predict the weight of both Males and Females based on height using the models found in part (a). Plot the predicted weight on the same scatter plots with the trendline from problems 1 and 2.

(c). Compute the R^2 value from the following formula

$$R^2 = 1 - \frac{SSE}{SST},$$

where $SSE = \sum (y_i - y\text{fit}_i)^2$ [i.e. sum of the squared error (or residual)]

and $SST = \sum (y_i - \bar{y})^2$ where $\bar{y}$ is the mean (or average) of y_i, i.e. $\bar{y} = \frac{1}{n} \sum y_i$

4. By looking at the data and comparing the R^2 values, do either of the models (the trendlines from problem 2 or the models from problem 3) seem to better describe the data? Why or why not?

Homework:

- Use Excel Solver and the Least Squares Criterion to fit the nonlinear model $y = A\sqrt{x}$ to the data in Table 4.4 (p. 142).
- Read through Example 2: Modeling a Bass Fishing Derby (p. 83-87). Then consider four possible models: $W \propto l^3$, $W \propto lg^2$, $W \propto l^2 g$, and $W \propto g^3$.
  - Interpret each model geometrically and explain how they are different.
  - In what circumstances, if any, would the three models coincide?
  - Which model do you think would do the best job of predicting W? Why?
  - Section 3.4, p. 136 #7-8.