This assignment is based on Sections 12.1 and 12.2 of Devore. The assignment must be in my dropbox when I come in on Thursday, January 24. You are allowed to use software such as R and/or Excel whenever you find it convenient.

1. Chapter 12, #3.

2. Consider the simple regression model

$$Y = \beta_0 + \beta_1 X + \varepsilon$$

    discussed in sections 12.1 and 12.2. Assume that $X = 0$ is within the scope of the model.

    (a) What is the implication for the regression function if $\beta_0 = 0$ so that the model is

$$Y = \beta_1 X + \varepsilon?$$

    That is, how would the regression function plot on a graph?

    (b) Find the least squares estimator of β_1 for the model $Y = \beta_1 X + \varepsilon$ given n points (x_i, y_i). (Follow the same procedure as in page 498 of Devore).

    (c) Show that the estimator you obtained in (b) for β_1 is unbiased.

3. Show that the vector of residuals and the vector of fitted values are orthogonal to each other. That is, let e_i denote the ith residual:

$$e_i \doteq y_i - \hat{y}_i,$$

    where $\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_i$. Then show that

$$\sum_{i=1}^{n} \hat{y}_i e_i = 0.$$

4. Chapter 12, #12

5. Chapter 12, #16

6. Chapter 12, #28