Homework 10

1. Problem 10 in Chapter 13 (textbook).

2. Dissociation pressure for a reaction involving barium nitride was recorded as a function of temperature (Orcutt 1970). The second law of thermodynamics gives the approximate relationship

$$\ln(pressure) = A + \frac{B}{T}$$

where T is absolute temperature. The data file "barium.txt" is given on the course web site. Form approximate 95% confidence intervals for A and B. Examine the residuals and comment. Is the last observation $(1165, 1.922000)$ a statistically plausible outcome?

3. Measurement of the concentration of small asbestos fibers is important in studies of environmental health issues and in setting and enforcing appropriate regulations. The concentrations of such fibers are measured most accurately by an election microscope, but for practical reasons, optical microscopes must sometimes be used. Keifer et. al. (1987) compared measurements of asbestos fiber concentration from 30 airborne samples by a scanning electron microscope (SEM) and by a phase contrast microscope (PCM). The data file "asbsetos.txt" is given on the course web site. Study the relationship between the two measurements, taking the more accurate SEM measurement as the independent variable and the PCM measurements as the dependent variable. Give a 95% prediction interval for the PCM measurement of an observed SEM measurement 2.01.

4. The volume, height and diameter at 4.5 ft above the ground level were measured for a sample of 31 black cherry trees in the Allegheny National Forest in Pennsylvania. The data were collected to provide a basis for determining an easy way of estimating the volume of a tree. Develop a model relating volume to height and diameter. In the data file "trees.txt", the columns of the data matrix are diameter, height, and volume, in that order (Ryan et. al. 1976).