Directions: Complete the exercises listed below. Include only relevant computer output for each exercise in order, and include as an appendix any computer code you used for the exercises. You should indicate in the appendix which portions of the code address which exercise. Data are available on the course text CD (and course text website; see link on course website). Some starter SAS code is provided on the class website (just to create the correct data sets in SAS). You may discuss the exercises with other students and with the instructor, but the work you turn in must be your own. Note that neatness and format (including code in appendix) will contribute 5 points to the total score. This assignment will be graded out of 95 points.

Exercises:

1. (4 points) Text problem 1.1
2. (4 points) Text problem 1.5
3. (4 points) Text problem 1.11
4. (16 points) Text problem 1.19
5. (16 points) Text problem 1.28
6. (16 points) Text problem 1.32 ; note that equations (1.9a), (1.9b), and (1.10a) are on page 17 of the text. The following may prove helpful along the way:
   - Solve (1.9a) for \( b_0 \), and plug this estimate into (1.9b):
     \[ \sum X_i Y_i = (\bar{Y} - b_1 \bar{X}) \sum X_i + b_1 \sum X_i^2 \]
   - Solve that for \( b_1 \) and obtain:
     \[ b_1 = \frac{\sum X_i Y_i - \bar{Y} \sum X_i}{\sum X_i^2 - \bar{X} \sum X_i} \]
   - Then show that this numerator and denominator equal those reported in (1.10a). You will need to use the following facts:
     \[ n\bar{X} = \sum X_i, \]
     \[ \sum Y_i = n\bar{Y}, \text{ and} \]
     \[ \sum X_i^2 \neq (\sum X_i)^2 \]
7. (6 points) Text problem 3.2 [Consider sketching “by hand” in Paint or equivalent (or on paper, and scan it), and pasting result into submitted document.]
8. (24 points) Based on text problem 3.32

(a) Fit a model to predict PSA from Volume. For residuals from this initial model fit: Report histogram (with normal curve), normal probability plot, sequence plot, and plot vs. predicted values; also report result of Brown-Forsythe & correlation test for normality. Comment briefly on what these diagnostics all suggest.

(b) Choose a remedial measure, and explain how you chose it.

(c) After applying this remedial measure: Report the same graphical and numerical diagnostics as part (a). Comment briefly on what these all suggest.

(d) Report predictive equation after remedial measure, and use it to predict PSA level (on original, not transformed, scale) for a patient with cancer volume 20 cc. (That is, make the prediction on the transformed scale used by your model, then transform that predicted value back to the original scale.)