1. Problem 14, p. 682. Test the hypotheses at level .05.

2. Problem 10b, p.673. To avoid fractions, take the last observation in the Small row to be 836 instead of 835.

3. Suppose that $y_i$ and $k_i$ are given numbers, $i = 1, ..., n$. Assume that at least one $k_i$ is $\neq 0$. Let $\hat{t}$ be the number $t \in \mathbb{R}$ which minimizes the function

$$g(t) = \sum_{i=1}^{n} (y_i - tk_i)^2.$$ 

Find a succinct formula for $\hat{t}$ in terms of dot products, norms and the vectors $\overrightarrow{y}$ and $\overrightarrow{k}$ whose components are respectively the $y_i$ and $k_i$.

4. Consider the situation of Problems 2-4 on HW8. We want now to test the hypothesis

$$H_0 : \beta_0 = \beta_1 = \beta_2$$

against the alternative that $H_0$ is false. This can be done using statistics $S^2, Q^2$ and $U^2$.

(a) Express $U^2$ in terms of $S^2$ and $Q^2$.

(b) What are the distributions of $S^2, Q^2$ and $U^2$ when $H_0$ is true?

(c) Find a formula for $Q^2$ of the form $Q^2 = \text{something} - S^2$, where "something" involves a vector $\hat{z}$ obtained from the number $\hat{t}$ found in Problem 2. You will need to figure out what $\overrightarrow{k}$ is. Illustrate your answer with a picture in $n$–space.

(d) Compute $U^2$ given the data in HW8. Do you accept or reject $H_0$ at level .05?