Math 644, Fall 2012
Homework 5 Due: Friday, 11/30/2012

1. For a model with X_1, X_2, X_3, X_4 predictors, we have $n = 30$ and $SSE(X_1) = 161.081, SSE(X_2) = 195.846, SSE(X_3) = 56.432, SSE(X_4) = 225.584,$
$SSE(X_1, X_2) = 146.635, SSE(X_1, X_3) = 16.579, SSE(X_1, X_4) = 161.044,$
$SSE(X_2, X_3) = 45.660, SSE(X_2, X_4) = 195.403, SSE(X_3, X_4) = 56.431,$
$SSE(X_1, X_2, X_3) = 12.436, SSE(X_1, X_2, X_4) = 146.604, SSE(X_1, X_3, X_4) = 16.383,$
$SSE(X_2, X_3, X_4) = 45.656, SSE(X_1, X_2, X_3, X_4) = 12.246, SST = 226.189.$

   (a) Find $SSR(X_1, X_2 \mid X_3, X_4)$.

   (b) In model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$, test $H_0 : \beta_1 = \beta_2 = 0$ with $\alpha = 0.05$.

   (c) Find the largest model in which every predictor variable is not significant at $\alpha = 0.05$.

2. State the number of degrees of freedom that are associated with each of the following extra sums of squares: (1) $SSR(X_1 \mid X_2)$; (2) $SSR(X_2 \mid X_1, X_3)$;
(3) $SSR(X_1, X_2 \mid X_3, X_4)$; (4) $SSR(X_1, X_2, X_3 \mid X_4, X_5)$.

3. Refer to Patient satisfaction data (see the example of chapter 2 in lecture notes). Obtain the analysis of variance table that decomposes the regression sum of squares into extra sums of squares associated with X_2; with X_1, given X_2; and with X_3, given X_2 and X_1.

4. Show that:

   (a) $SSR(X_1, X_2, X_3, X_4) = SSR(X_1) + SSR(X_2, X_3 \mid X_1) + SSR(X_4 \mid X_1, X_2, X_3)$.

   (b) $SSR(X_1, X_2, X_3, X_4) = SSR(X_2, X_3) + SSR(X_1 \mid X_2, X_3) + SSR(X_4 \mid X_1, X_2, X_3)$.