Homework 5

1. The file `bodytemp.csv` contains normal body temperature readings (in degrees Fahrenheit) and heart rates (beats per minute) of 65 males (coded by 1) and 65 females (coded by 2).

   (a) For both males and females make scatter plots of heart rate versus body temperature. Comment on the relationship or lack thereof.

   (b) Does the relationship for males appear to be the same as that for females? Examine this question graphically, by making a scatter plot showing both females and males and identifying females and males by different plotting symbols.

   (c) Construct an F test to test whether the two regression lines are identical.

   (d) Devise and apply a permuation test of this hypothesis.

   (e) Test whether the slopes are the same but the intercepts are not equal.

2. Consider simple linear regression, $Y_i = \beta_0 + \beta_1 x_i + e_i$ where $e \sim MVN(0, \sigma^2 I)$. Assume for simplicity that $n = 25$ and that $\sum_{i=1}^{n} x_i = 0$.

   (a) What is a 95% confidence interval for β_0?

   (b) What is a 95% confidence interval for β_1?

   (c) What is a 95% confidence region for (β_0, β_1)?

   (d) Compare graphically the regions found in (a) and (b) to the region found in (c).

   (e) How can the hypothesis that $\beta_0 = 0$ and $\beta_1 = 1$ be tested?

3. Verify explictly that the least squares estimates for the α_i in the balanced two way layout are the same whether or not the β_j are set equal to zero.