Course: Math 50 Dartmouth College (MWF 11:15 AM-12:20 PM ), Fall 2015
Instructor: Nishant Malik
Homework Sheet Number: 3
Posted on: 10/02/2015
Due on: 10/09/2015

**Directions**: Any problem marked with asterisk (*) should be completed using IPython Notebook (Jupyter) and can be uploaded at https://dropitto.me/m50f15 .

1*. Refer to the **Muscle mass** problem in the previous homework sheet.

(a). Conduct a test to decide whether or not there is a negative linear association between amount of muscle mass and age. Control the risk of Type I error at .05. State the alternatives, decision rule, and conclusion. What is the P-value of the test?

(b). The two-sided P-value for the test whether $\beta_0 = 0$ is $0+$. Can it now be concluded that $b_0$ provides relevant information on the amount of muscle mass at birth for a female child?

(c). Estimate with a 95 percent confidence interval the difference in expected muscle mass for women whose ages differ by one year. Why is it not necessary to know the specific ages to make this estimate?

Data source: https://netfiles.umn.edu/users/nacht001/www/nachtsheim/Kutner/Chapter%20%201%20Data%20Sets/CH01PR27.txt

Reference: *Kutner et. al. "Applied Linear Regression Models", Ed. 5 (problem no 2.27 on pages 93-94).*

2. A member of a student team playing an interactive marketing game received the following computer output when studying the relation between advertising expenditures $(X)$ and sales $(Y)$ for one of the team's products:
Estimated regression equation: $Y = 350.7 - .18X$
Two-sided P-value for estimated slope: .91
The student stated: "The message I get here is that the more we spend on advertising this product, the fewer units we sell!" Comment.

Reference: *Kutner et. al. "Applied Linear Regression Models", Ed. 5 (problem no 2.3 on page 90).*

3. Given that $Y_i = \beta_0 + \beta_1 X_i + \epsilon_i$ is a normal error regression model, comment on the sampling distribution of $b_1$. And derive expressions for $E\{b_1\}$, $\sigma^2\{b_1\}$ and $s^2\{b_1\}$.