15.075 Statistical Thinking and Data Analysis
Computer Exercises 3
Due December 8, 2011

Instructions: Please solve the following exercises using MATLAB. One simple way to present your solutions is to copy all of your code and results (plots, numerical answers, etc.) into a Word document, which you should submit in class. There is no online submission. **Do NOT share code!**

Exercise 1 (30 pts)

To determine whether glaucoma affects the corneal thickness, measurements were made in 8 people affected by glaucoma in one eye but not in the other. The corneal thicknesses (in microns) were as follows:

Person	1	2	3	4	5	6	7	8
Eye affected by glaucoma	488	478	480	426	440	410	458	460
Eye not affected by glaucoma	484	478	492	444	436	398	464	476

Assume the corneal thicknesses are normally distributed with mean μ_1 and variance σ^2_1 for eyes affected by glaucoma, and mean μ_2 and variance σ^2_2 for eyes not affected by glaucoma. Test $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 < \mu_2$ using $\alpha = 0.1$. What kind of test will you perform? Base your conclusion on a 90% confidence interval.

Exercise 2 (70 pts)

The following data give the barometric pressure x (in inches of mercury) and the boiling point y (in °F) of water in the Alps.

x	y	x	y	x	y
20.79	194.5	23.89	200.9	28.49	209.5
20.79	194.3	23.99	201.1	27.76	208.6
22.40	197.9	24.02	201.4	29.04	210.7
22.67	198.4	24.01	201.3	29.88	211.9
23.15	199.4	25.14	203.6	30.06	212.2
23.35	199.9	26.57	204.6		

a. Make a scatterplot with pressure x on the x-axis and boiling point y on the y-axis. Does the relationship appear to be approximately linear?
b. Fit a least-squares line. What are the coefficients of the line? What are their t-statistics?
c. Plot the least-squares line in the same figure with the scatterplot.
d. What proportion of variation in the boiling point is explained by the linear regression model on the barometric pressure?
e. Is the slope coefficient significantly different from zero? How do you know? If yes, at what significance level?
f. What are SSR, SSE, SST, MSR, MSE and F?

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