ST 512 Homework assignment #3 (more problems may be added)

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1. Rao 9.17ac(Use $1 - \alpha = 0.95$ and also obtain Scheffé and Bonferroni intervals for all pairwise differences.)

2. Using the data from Rao 10.2, test the adequacy of the simple linear regression model in which the mean soil water content is linear in depth. Which model would you select, the linear regression model or the one-factor ANOVA model with 4 treatment means?

3. Consider designing an experiment to evaluate the potential effectiveness of $t = 5$ weight reducing agents. Suppose that n subjects are to be assigned at random to each of $t = 5$ treatment groups. Suppose that the smallest meaningful effect on weight loss that researchers involved in the study would like to detect is one in which the variance among the weight loss treatment means is at least as great as those given in the alternative below:

$$H_1 : \mu_A = \mu_E = 12, \mu_B = 11, \mu_C = 10, \mu_D = 9$$

Suppose further that the standard deviation among weight losses for any treatment group is about $\sigma = 1$. Hold the type I error rate at $\alpha = 0.05$.

   (a) Compute the number of subjects necessary to obtain a power of at least $1 - \beta = 0.9$.

   (b) Obtain a plot of the power against sample sizes between 2 and 10.

   (c) Describe how the power would change if σ were actually larger.

   (d) Describe how the power would change if the population mean weight gain for agent 1 were $\mu_1 = 15$.

   (e) Suppose the $n = 10$ is adopted, and data are observed as given in the table below.

Weight losses under five agents

	A	B	C	D	E
mean	12.05	11.02	10.27	9.27	12.17
std.dev.	.83	1.12	1.03	1.16	0.79

      i. Carry out a test for the hypothesis that the treatment has no effect on weight loss. Use $\alpha = 0.05$

      ii. After carrying out all pairwise comparisons at familywise error rate $\alpha = .05$, identify which differences are significant. Be clear about which multiple comparison procedure you use.

      iii. Explain the difference between strong and weak control of the familywise error rate in this context.