Review Guide for Exam 3

April 13, 2000

Time and Place of Exam: The exam will be in class, on **Thursday April 20**.

Exam Materials: The exam is closed book. You can prepare a formula sheet: a standard-size sheet of paper on which you can write whatever you like, both sides. (As before, a simple formula sheet will be provided with the exam.) You should bring a calculator.

Exam Coverage: Questions for the exam will be based on material in sections of Chapters 9-12 as detailed below:

> **Chapter 9:** Section 9-4 (paired t-test)
>
> **Chapter 10:** Entire chapter *Except* 10-8.3 (lack-of-fit test) and 10-10 (correlation).
>
> **Chapter 11:** We've covered topics from much of this chapter, but my emphasis is on understanding basic concepts, some principles of model-building, and how to interpret computer output (specifically, plots and regression output from Minitab). You **will not** need to know how to manipulate matrices for the exam.
>
> **Chapter 12:** The notes on the web show you what I had hoped to cover, namely 12-1, 12-2, and part of 12-3. We won't get that far. You should definitely understand the text and notes on some basic concepts of design (12-1). I'm not sure if anything else from Chapter 12 will be on the exam; that depends on what I can cover this week. I'll let you know on Tuesday.

Review: I plan to use at least part of Monday's class for review. So bring your questions! Below is a summary of most of the material covered by the test:

1. Review the material on the F-distribution from the text and notes for Chapter 9. You should be familiar with the tables of the F-distribution in the textbook..
2. **The paired t-test:** Why it is useful and how it is done.
3. **Simple linear regression:** Least-squares estimation. Basic properties of estimates (unbiased, normal, with certain estimated standard errors). The residual standard deviation (σ), and how we estimate it. Test of hypotheses and confidence intervals for coefficients, mean responses, and predicted values. Residuals and the interpretation of residual plots. The F-test and the analysis of variance table for the regression model. The coefficient of determination (R^2).
4. **Multiple regression:** When is a regression model linear, and when is it nonlinear. All of the above topics, but for a model with more than one independent variable (i.e., more than one *regressor*. In addition, when there is more than one potential independent variable, model selection (or "model building") is an issue. You should know something about how to select a reasonable model by interpreting t-ratios, the analysis of variance table for the regression, R^2, and residual plots. You should also know what *multicolinearity* is and why it can be a problem. The last homework provides an introduction to model-building.

   You should understand what the various numbers on a regression output mean, and how to interpret and use them. There are Minitab examples in the notes; I'll continue to go over them in class.
5. **Chapter 12:** Basic concepts of design of experiments: factors, levels, blocking, randomization. Notes and text for Section 12-1. If I'm going to hold you responsible for anything else from Chapter 12, I'll tell you on Monday.

- **Some Review Problems:** 9-81, 10-11, 10-18, 10-31, 10-32, 11-1, 11-13, 11-31.

  I've tried to pick problems that you can do without a computer. If you want to try some of the many examples which require Minitab, it's probably simplest to enter the data into a column using the **set** or **read** commands, as in the following examples:

```
MTB > set c1
DATA> 1 2 3 4
DATA> 5 6
DATA> end
MTB > print c1
 C1
   1    2    3    4    5    6

MTB > read c1 c2
DATA> 1 2
DATA> 3 4
DATA> 5 6
DATA> end
      3 rows read.
MTB > print c1 c2
  ROW   C1   C2
    1    1    2
    2    3    4
    3    5    6
```