

## Math 356H Assignment #4

### Readings:

- Week 7 (Feb. 25 - Feb. 29). **Other issues in multiple regression.**
  - (D) Section 13.5.
  - *Optional:* (NWK) Chapter 12. The equivalent to Section 13.5 in more detail.
- Week 8 (Mar. 3 - Mar. 7). **Single-Factor ANOVA.**
  - (D) Sections 10.1 and 10.2.

**Due date:** Wednesday, March 12

1. Chapter 13, #53
2. Chapter 13, #58
3. Refer to the data in Chapter 10, #6
  - (a) What is the response variable? What is the factor?
  - (b) How many levels of the factor are being studied?
  - (c) Check and comment on the ANOVA assumptions for this problem:
    - i. Is there any reason to believe that errors are not independent?
    - ii. Does total FE look normally distributed for each of the factors?
    - iii. Calculate the sizes of the sample variances and do a visual check of the data by looking at boxplots of the data to see whether the spread in each sample looks about the same.
  - (d) Perform the ANOVA test.
  - (e) If applicable, use Tukey's procedure to identify differences.
4. The following partial ANOVA table is taken from the article "Perception of Spatial Incongruity" in which the abilities of three different groups to identify a perceptual incongruity were assessed and compared. All individuals in the experiment had been hospitalized to undergo psychiatric treatment. There were 21 individuals in the depressive group, 32 individuals in the functional "other" group, and 21 individuals in the brain-damaged group. Complete the ANOVA table and carry out the  $F$  test at level  $\alpha = 0.01$ .

Source	df	sum of squares	Mean square	$F$	$P$
Groups			76.09		
Error					
Total		1123.14			

5. A chemical engineer is studying a newly developed polymer to be used in removing toxic wastes from water. Experiments are conducted at five different temperatures. The response noted is the percentage of impurities removed by the treatment:

	Temperature				
	I	II	III	IV	V
	40	36	49	47	55
	35	42	51	49	60
	42	38	53	51	62
	48	39	53	52	63
	50	37	52	50	59
	51	40	50	51	61

- (a) Test the hypothesis of equal treatment means.
  - (b) Use Tukey's procedure to compare all possible pairs of means.
6. Chapter 10, #17. Keep in mind that if all sample sizes are equal,  $MSE$  is just the average of the variances (see p.407).