Homework 10 Due on April 14

§12.2: 1, 2, 4, 7, 9, 10.
§12.3: 1, 4.

§12.2: The F Test

Question 12.2.1 The following are the gas mileages recorded during a series of road tests with four new models of Japanese luxury sedans. Test the null hypothesis that all four models, on the average, give the same mileage. Let $\alpha = 0.05$. Will the conclusion change if $\alpha = 0.10$?

A	B	C	D
22	28	29	23
26	24	32	24
	29	28	

Question 12.2.2 Mount Etna erupted in 1669, 1780, and 1865. When molten lava hardens, it retains the direction of the Earth's magnetic field. Three blocks of lava were examined from each of these eruptions and the declination of the magnetic field in the block was measured. The results are given in the following table. Do these data suggest that the direction of the Earth's magnetic field shifted over the time period spanned by the eruptions? Let $\alpha = 0.05$.

1669	1780	1865
57.8	57.9	52.7
60.2	55.2	53.0
60.3	54.8	49.4

Question 12.2.4 Each of five varieties of corn are planted in three plots in a large field. The respective yields, in bushels per acre, are in the following table.

Variety 1	Variety 2	Variety 3	Variety 4	Variety 5
46.2	49.2	60.3	48.9	52.5
51.9	58.6	58.7	51.4	54.0
48.7	57.4	60.4	44.6	49.3

Test whether the differences among the average yields are statistically significant. Show the ANOVA table. Let $\alpha = 0.05$

Question 12.2.7 Fill in the entries missing from the following ANOVA table:

Source	df	SS	MS	F
Treatment	4			6.40
Error			10.60	
Total		377.36		

Question 12.2.9 Prove

$$SSTOT = \sum_{j=1}^{k} \sum_{i=1}^{n_j} Y_{ij}^2 - C$$

and

$$SSTR = \sum_{j=1}^{k} \frac{T_{\cdot j}^2}{n_j} - C$$

and specify the value of C.

Question 12.2.10 Show that under $H_0 : \mu_1 = \cdots = \mu_k$, $SSTR/\sigma^2$ has a chi square distribution with $k-1$ degrees of freedom.

Question 12.3.1 Use Tukey's method to make all the pairwise comparisons for the heart rate data of Case Study 12.2.1 at the 0.05 level of significance.

Question 12.3.4 Construct 95% Tukey intervals for all ten pairwise differences, $\mu_i - \mu_j$, for the following data:

Variety 1	Variety 2	Variety 3	Variety 4	Variety 5
46.2	49.2	60.3	48.9	52.5
51.9	58.6	58.7	51.4	54.0
48.7	57.4	60.4	44.6	49.3

Summarize the results by plotting the five sample averages on a horizontal axis and drawing straight lines under varieties whose average yields are not significantly different.