(1 pt. BONUS) 1. BONUS: Show that SST = SSE + SSA

(2 pts.) 2. In each of the following problems, use the summary statistics and the Tukey confidence intervals to construct the corresponding graph indicating which pairs of means are and are not significantly different. No work is required.

(1 pt.) a)

Sample means	Difference	Confidence interval
$\bar{x}_{1\cdot} = 4.82$	$\mu_1 - \mu_2$	$(-5.69, -1.13)$
$\bar{x}_{2\cdot} = 8.23$	$\mu_1 - \mu_3$	$(-4.49, 0.07)$
$\bar{x}_{3\cdot} = 7.03$	$\mu_2 - \mu_3$	$(-1.08, 3.48)$

(1 pt.) b)

Sample means	Difference	Confidence interval
$\bar{x}_{1\cdot} = 201.7$	$\mu_1 - \mu_2$	$(9.98, 56.20)$
$\bar{x}_{2\cdot} = 168.6$	$\mu_1 - \mu_3$	$(13.20, 59.42)$
$\bar{x}_{3\cdot} = 165.4$	$\mu_1 - \mu_4$	$(-19.89, 26.33)$
$\bar{x}_{4\cdot} = 219.7$	$\mu_2 - \mu_3$	$(-41.10, 5.12)$
	$\mu_2 - \mu_4$	$(-74.19, -27.98)$
	$\mu_3 - \mu_4$	$(-77.41, -31.20)$

(2 pts.) 3. In each of the following problems, the results from a multiple comparison procedure are shown graphically. Use each illustration to identify all pairs of population means that are significantly different. No work is required.

(1 pt.) a)

	$\bar{x}_{3\cdot}$	$\bar{x}_{1\cdot}$	$\bar{x}_{2\cdot}$	$\bar{x}_{4\cdot}$
Sample mean	12.69	14.64	15.94	16.21

(1 pt.) b)

	$\bar{x}_{2\cdot}$	$\bar{x}_{3\cdot}$	$\bar{x}_{5\cdot}$	$\bar{x}_{1\cdot}$	$\bar{x}_{4\cdot}$
Sample mean	4.67	6.08	6.23	6.30	7.20

(17 pts.) 4. Nondairy creamers (for coffee and tea)contain vegetable fat, corn-syrup solids, casein, and other ingredients. Independent random samples of various nondairy creamers were obtained, and the percentage of fat in a serving size was measured. The following table provides the summary data.

Brand	Carnation	Clover	Dean	Eagle
n	11	11	11	11
$\bar{x}$	38.00	34.55	43.92	35.75
s	4.47	4.30	5.02	5.22

(1 pt.) a) Is the constant standard deviation assumption valid in this case?
(4 pts.) b) Fill in the following ANOVA table given the information below. Remember work is required for each box in the table.

Source of Variation	Sum of squares	Degrees of freedom	Mean square	F
Factor			203.8	
Error			22.9	
Total				

(5 pts.) c) Assuming that the populations are normal, is there any evidence to suggest that at least two nondairy creamers have a different population mean percentage of fat per serving? Use α = 0.05. Perform the complete 4-step summary. Be sure to include the two degrees of freedom necessary to calculate the p-value. No work is required for numbers calculated in part b).
(5 pts.) d) Construct the Tukey 95% confidence intervals to isolate the pairs of means contributing to the overall difference. For each pair indicate where the two means are different or not.
(1 pt.) e) Draw a graph to represent the results of the multiple comparison procedure in part d).
(1 pt.) f) If you are trying to reduce the amount of fat in your diet, which nondairy creamer(s) should you use? Explain your answer.