1) (5 points)

<table>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td>16.1</td>
<td>9.7</td>
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<tr>
<td>3</td>
<td>10.5</td>
<td>13.3</td>
<td>11.4</td>
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<td>4</td>
<td>10.6</td>
<td>14.8</td>
<td>12.4</td>
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<td>14.9</td>
<td>6.7</td>
</tr>
</tbody>
</table>

a) For the data given above, check that the assumptions that we can check with the residual plots and the modified Levene test are true for performing a one-way ANOVA.

b) The data are the test scores of a sample of students randomly assigned to five sections of a class taught by five different instructors (the treatments). If an award is to be given to the instructor(s) who best prepared their students, which one(s) should win?

c) The data are the miles per gallon that resulted from a fleet of test cars using different gasoline additives (the treatments). The 25 cars and drivers were randomly assigned to the five:

1=Additive type A, made by manufacturer 1
2=Additive type B, made by manufacturer 1
3=Additive type A, made by manufacturer 2
4=Additive type B, made by manufacturer 2
5=no additive

It is desired to compare the affect of using an additive to using no additive, to compare manufacturer 1 to manufacturer 2, and to compare type A to type B.

2) (1 points) For the experiment described below, say whether or not it is factorial, with replication, balanced, and fixed effect, and how you can tell.

An ANOVA is performed to see how effective different methods of studying are, and how much extra time spent helps. Students studied by either primarily going over old exams, reading notes, or reading the text; and they studied for either two, five, or ten hours. The twenty students were randomly assigned so that four spent two hours using the text, four spent two hours using the notes, four spent two hours using the old exams, four spent five hours using text, and four spent ten hours using the text.
3) (4 points) The data on the web is extracted from a study that appeared in *European Bulletin of Cognitive Psychology*. Eight adopted children were selected from each of four groups. The four groups were based on two factors: adoptive parents had either very high or very low social economic status, and the biological parents had either very high or very low social economic status.

The data for this problem is on the web-site.

a) Write down the model equation for this two-way ANOVA being careful to identify the parameters.

b) Check the assumptions for the two-way ANOVA... including using Levene’s test for the variances. Also, comment on why it is unreasonable to expect data of this sort to have the independence you would usually find in an experiment.

c) State what hypotheses are being tested by the p-value in the ANOVA table and the p-value in the Type III tests, in terms of the parameters you wrote down in part A. Also describe what each of your conclusions mean in a brief sentence or two.

d) Construct an appropriate display to illustrate the main effects and interactions (see the handout on the course web-page for more information).