Directions: Answer each question synthesizing the information from the notes, readings, and other resources. When appropriate, insert statistical output (and input if need be) to justify each of your answers. Answers to the questions must be word-processed using Word or other program like LaTex or an Equation Editor (an object to be inserted within Word) for statistical/mathematical notation. Answers to the homework questions should appear on 8.5" x 11" paper (not computer output) and must be legible and free of grammatical errors. Students with clarifying questions about the homework should contact Dr. Harring directly. A point total for each question is provided at the end of each question. The total number of points for assignment 1 is 14.

Part A: Independent Samples T-test (this is review)

Everitt, in Hand et al. (1994), reported on family therapy as a treatment for anorexia. Everitt showed that girls receiving family therapy gained weight over the course of the therapy. However, it is possible that they gained weight just because they got older. One way to control for this is to look at the amount of weight gained by the Family Therapy group ($n = 17$) in contrast with the amount of weight gained by girls in a Control group ($n = 26$), who received no therapy. The dataset is Therapy.csv and can be found on the course website on ELMS.

1. Use graphs and summary statistics to describe the outcome variable (y) by experimental group (*group*: 0 = Control; 1 = Family Therapy). Include tables and figures together with appropriate interpretations in your write-up. (2 pts)
2. At the $\alpha = 0.01$ significance level, test whether there is a group mean difference in weight gain (positive values indicate gain, negative values indicate weight loss) using the appropriate *t*-test. Write out the statistical null and alternative hypotheses; report your test statistic, *p*-value, and write a conclusion in the context of the problem using the format in the statistical write-up template on the course website. (3 pts)
3. Construct the 99% confidence interval (CI) for the population group mean difference in weight gain. Interpret this interval. (2 pts)

Part B: Test of Group Variances

The independent-sample t-test requires equal variances across groups. However, it is usually difficult to determine visually whether the two distributions have the same variance. So we often rely on formal statistical tests to disprove the equal variance assumption. Use $\alpha = 0.05$ for the following two questions.

1. Conduct the variance-ratio *F*-test on weight gain (y) using *group* as the grouping variable. Report your *p*-value. Based on this *p*-value, what do you conclude? (2 pts)
2. Conduct Levene's test on weight gain (y) using *group* as the grouping variable. Report your *p*-value. Does Levene's test lead to the same conclusion as the *F*-test you performed in the previous question? (3 pts)
3. A negative *F*-test statistic in the context of testing variances of two groups (like that in Q1 of this section) is impossible? True or False? Explain (2 pts).