Statistics 411/511
Homework 4
Due Tuesday, October 27 by midnight Pacific time

- **Instructions:** Upload homework to Gradescope via Canvas (access specific homework assignments from the Assignments link on the Canvas course page). Your file must be a pdf document. Please see the end of the syllabus for formatting guidelines.
- The problems are assigned from the **third edition** of the textbook. If you have another edition, consult the copy on reserve at the library website for the homework problems.
- **Academic Integrity** You are encouraged to *discuss* the homework with other students, but what you turn in must be your own work in your own words. **DO NOT** copy someone else's homework. You may share ideas and R code, but do not share R output or written language. The syllabus contains details and links to OSU's Student Conduct Code and procedure for reporting suspected academic misconduct.

1. Revisit the college tuition data of Homework 3, described in exercise 32 on page 82. This question will focus on the in-state tuition. The research question is similar to the one in Homework 3: "Is in-state tuition higher at private universities, and if so, by how much?"
   (a) Make side-by-side boxplots of in-state tuition for the two college types, public and private. Include your R code and your plot.
   (b) Does your plot in part (a) suggest that the equal variance assumption for the two-sample t-test is violated? Why or why not?
   (c) State the null and alternative hypotheses to answer the research question. Your hypotheses should be in terms of population parameters. Define any notation you use for the population parameters.
   (d) Conduct a Welch's t-test of your hypotheses in part (c). Include your R code but not output.
   (e) Write a statistical conclusion to report the results of your hypothesis test in part (d).
   (f) Obtain a two-sided confidence interval for the difference in population means. Do not submit R code or output. Instead, write a statistical conclusion reporting this interval.

2. This problem deals with the data of exercise 4.31 on page 110 of the textbook.
   (a) The research question stated in exercise 4.31 is the following. "Is there indeed evidence of an effect of the group therapy treatment on survival time and, if so, how much more time can a breast cancer paient expect to live if she receives this therapy?"
   State null and alternative hypotheses in terms of the shift parameter discussed in item 2(g) of Lab 4 and on page 3 of Outline 4.
   (b) Conduct a Wilcoxon rank-sum test of your hypotheses in part (a). Submit your R code but not output.
   (c) Write a statistical conclusion for the hypothesis test in part (b).

3. Revisite the NavDat data of Homework 2. In problem 1 of Homework 2, you did a paired t-test to test the null hypothesis that the mean difference is 0. Use the sign test to test the null hypothesis that the median difference is 0. Include your R code and output.