Homework 5 – Intro. to Computational Statistics

For all problems, please show all your work. For any of the following calculations, feel free to mix calculations by hand with R calculations, but in most cases, you should try to do something by hand if it seems feasible, and only use R if the calculation is complex.

1.

You hypothesize that the average person is smarter than Sarah Palin. You know her IQ is 100. You give an IQ test to 100 randomly selected people, and get a mean of 104 and standard deviation of 22. Please show your work for each question.

a. What is your null hypothesis?

b. What is your research hypothesis?

c. What is your test statistic?

d. Do you prefer a one-tailed or two-tailed test here, and why?

e. What is your α and threshold (t statistic) value or values for your rejection region? (Whatever α you prefer is fine, just be sure to state it and explain why you chose it.)

f. Can you reject the null under a one-tailed test?

g. Can you reject the null under a two-tailed test?

h. What is your 95% confidence interval?

i. What is the p-value for your test results?

2.

You hypothesize that men and women have different skill levels in playing Tetris. To test this, you have 50 men and 50 women play the game in a controlled setting. The mean score of the men is 1124 with a standard deviation of 200 and the mean score for the women is 1245, also with a standard deviation of 200.

a. Are these scores statistically significantly different? Show your work.

b. Do you reject your hypothesis or the null? What do you conclude from this experiment?

3.

You think drinking the night before an exam might help performance on the exam the next morning. To test this, you select 100 of your closest friends, and randomly get 50 of them drunk the night before the exam, which you denote the treatment group. The next day, the treatment group gets a mean of 78 with a standard deviation of 10 and the control group gets a 75 with a standard deviation of 5.

a. Does the evidence show that drinking helped exam performance?

4.

Using data of your choosing (or using simulated data), use R to conduct the following tests, and explain the results you get:

a. A standard one-sample hypothesis test.

b. A difference-in-means test with independent samples.

c. A difference-in-means test with dependent samples (ie, a paired t-test).

d. Manually verify the results in (a) using the mean and sd as calculated by R (ie, you don't have to manually calculate the mean or sd by hand!).