Exam 01: Takehome Portion

Name: _____

(20 points) This take-home exam is due at the start of class on Monday, February 19th. You must work on your own, but may use any static external references that you need. Note that I have uploaded an R notebook that you may find useful to compute the summary statistics below, but it is not obligatory to use R (but it is likely much easier) nor do you need to hand in any of the code. This sheet is all that I need.[1]

[1] No need to show any work. I just want the results. My assumption is that you are doing the computations in R.

General Task For this exam, you need to design a two-sample experiment where you collection numeric data from two different groups and then compare the means and variances using the techniques we have developed in class. Each of the two samples should have a minimum of 15 observations. Be creative. The only rule is that you should be actually collecting the data yourself, not taking it from a source that is already put together somewhere.[2] Once you have the data, answer the following questions.

[2] Just some ideas if you are stuck: observing students or cars at different places on campus and recording something about them; watching ads on two different websites or television shows; counting features of random pages in different books.

1. Briefly describe the design of your experiment. What are the two groups and what numeric feature are you collecting. This should possible to do in a short 3-5 sentence paragraph. Identify which group you are calling X and which one is Y for the purpose of the summary statistics below.

2. What are the sample sizes n and m?

3. What are the sample means $\bar{X}$ and $\bar{Y}$?

4. What are the sample variances S_X^2 and S_Y^2?

5. What is the pooled variance S_p^2?

6. Give a confidence interval for $\mu_X - \mu_Y$ at the 99% confidence level.

7. Test the null hypothesis $H_0 : \mu_X = \mu_Y$. Provide the test statistic and indicate whether you would reject at the 95% confidence level.

8. Give a confidence interval for σ_Y^2/σ_X^2 at the 99% confidence level.

9. Test the null hypothesis $H_0 : \sigma_Y^2 = \sigma_X^2$. Provide the test statistic and indicate whether you would reject at the 95% confidence level.