Minitab Notes for Activity 7

Creating the Worksheet
1. Label the first column as male and the second column as female.
2. Enter the male self-esteem scores into the first column and the female self-esteem scores into the second column.

Summarize the Data
1. Go to Stats / Basic Statistics / Display descriptive statistics
   a. Select male and female as the variables
   b. Click OK

Determining Normality
There are two samples here and we need to decide if each comes from a normal population or not. You are specifically instructed to use a normal probability plot for this question, although you are later asked for other ways to accomplish checking normality.

1. Go to Graph / Probability Plot
   a. Choose male (C1) for the variable.
   b. (optional) Choose options and turn off "Display table of percentile estimates" and then click OK.
   c. Click OK
2. Interpret the normality based on the plot
3. Repeat the process with female as the variable

Testing Equality of Two Variances
There are two tests used by Minitab to test two variances. One is the F-Test, which is the one we talked about in class and the other is Levene's Test. The F-test is used when the samples come from normal populations and Levene's Test is used if they don't. The F-test requires that the larger sample variance be on top, so go back and look at the summary statistics and see which one has the larger variance (standard deviation).

1. Go to Stat / Basic Statistics / 2 Variances
   a. Click "Samples in 2 columns"
   b. Choose the sample with the larger variance for the first sample
   c. Choose the sample with the smaller variance for the second sample
   d. Click OK
2. If the test statistic for the F-test is less than one, then you put your samples in backwards and you need to re-run the test with them switched.
3. Use the p-value from the appropriate test (usually they have the same end result)
Finding Critical Values - for the 2 Sample T-Test

Minitab doesn't give critical values when it does hypothesis testing. You will need to use the degrees of freedom, level of significance, type of test, and distribution used to look up the critical value(s) from the textbook.

For those who enjoy technology, Minitab can be used to find the critical values, much like we used Excel on the last test. It uses something called the "Inverse Cumulative Probability" which takes the area in the left tail and returns the critical value for that. Note that this is different than the critical value notation, which always uses the right tail area. Here's how to find the critical value on Minitab.

1. Go to Calc / Probability Distributions and choose the t distribution
   a. Choose the "Inverse cumulative probability".
   b. Enter the degrees of freedom
   c. Choose "Input Constant" and enter the area in the left tail.
      i. If you have a left tail test, just enter the area. For example, if you have 0.05 in the left tail, just enter 0.05.
      ii. If you have a right tail test, you have to take 1-area to get the left tail area. For example, if you have 0.05 in the right tail, then you have 1-0.05=0.95 in the left tail. Enter 0.95 into Minitab.
      iii. If you have a two-tail test, divide the area by two and repeat this exercise twice. For example, 0.05 in two tails means 0.05/2 = 0.025 in each tail. Run through this once and choose the left tail area with 0.025 and then again with a right tail area of 0.025 (follow the instructions in part ii)
   d. Click OK

Finding the Test Statistic, Probability Value, and Confidence Interval

1. Go to Stat / Basic Statistics / 2 Sample t
   a. Check "Samples in different columns"
   b. Choose male for the first column and female for the second column. The order doesn't really matter here, except that it will take the first sample minus the second sample when it finds the test statistics and the confidence interval. If you switch the variables around, it will just change the signs, but the p-value will still be the same.
   c. If you earlier found that the variances were equal, check the "assume equal variances" box. Note: If you don't have equal variances, the df used by Minitab is a more accurate value than what our textbook uses. Go ahead and use the critical values you looked up from the text book based on the smaller of the two df's.
   d. Go into Options
i. Notice that we're doing hypothesis testing which requires a level of significance, but Minitab is asking for a confidence level instead. Make sure you enter the confidence level that agrees with our level of significance.

ii. The test mean is how much difference we want. In this case, we want no difference, so the value should stay at zero.

iii. The alternative hypothesis is how you tell Minitab whether it is a left tail, right tail, or two tail test.

iv. Click OK

e. Click OK

2. Notice that the summary statistics are given here, so if you would have known that earlier, you could have saved some time.

3. The confidence interval given by Minitab corresponds to the values of the difference that would fall into the non-critical region.