Math 159
Nonparametric Analysis
Spring 2010
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HW4b: Section 5.1

HOMEWORK THOUGHTS: A large part of this course is learning how to interpret and communicate results. That is, an isolated p-value will not ever be a complete answer to a question. As stated below, please always explain your answers in a sentence or two (unless, of course, the problem is truly just computational).

Consider the situation discussed in class on the Wilcoxon Rank Sum test. Your task is to evaluate the power/size of the WRS test for different types of data. Using the steps below, create 3 types of data sets: (1) t_3 (heavy tailed), (2) χ^2_3 (skewed right), and (3) normal with a symmetric outlying value; that is, use `runif(1,min=-47,max=47)` within the data generation command.

Note I: for each type of data, you should generate a null setting and an alternative setting. The values for the null setting should be obvious. The values for the alternative setting are up to your discretion. Feel free to experiment with different values.

Note II: Let your sample size be 50.

Note III: All standard deviations should be $\sqrt{3}$. To give the χ^2_3 data the same variance as the others, modify the following command (generate a χ^2, subtract the mean, divide to get the correct variance, and shift by adding the appropriate center for either the null or alternative setting).

```
csq<-(rchisq(n,df=3)-3)/sqrt(6)*sqrt(3)+mu
```

1. You should have two different (types of) test statistics, what are they?
2. For what values of each would you reject the null hypothesis?
3. Describe how you calculate the probability of a type I error (α) and the power ($1-\beta$).
4. Plot histograms of your test statistic for the two different data sets (null data set and alternative data set). You should have 12 histograms displayed on 6 different plots.
5. Calculate empirical (simulated) values for α and power for each of the 6 tests.
6. What can you say about the relationship of the independent t-test to the Wilcoxon Rank Sum test for different types of data? Explain.