Nonparametric Statistics Homework III.

Due date: Nov. 12. 2:30pm. Worth 5% of your final grade.

1. Gross sales before and after a training program is given by
   Sales person: 1 2 3 4 5 6
   Sales before: 90 83 105 97 110 78
   Sales after : 97 80 110 93 123 84.
   Determine if the training program is effective using the sign test. What is the P-value?

2. Answer Problem 1 using the signed-rank test. What assumptions are you making? Compare your result with Problem 1.

3. Using the Mann-Whitney test, check if the women's height are related to age in a pairwise fashion. There are six possible pairwise comparisons. For example, you need to compare 20-29 vs. 30-39 and 20-29 vs. 40-49 etc. As this problem illustrates, the Mann-Whitney test is not suitable for testing more than two samples.
   20-29: 63.75 68.25 62.25 67.25
   30-39: 64.75 67.5 64.75 66.5
   40-49: 68.5 64.25 64.5 66
   50-59: 65.25 64.75 67.5

4. Using the Kruskal-Wallis test, check if the women's heights are related to age from Problem 3. Compare your result with Problem 3.

5. Using the Kolmogorov-Smirnov two-sample test, show that the t statistic with large degrees of freedom can be approximated by the standard normal distribution. How large should the degrees of freedom be ? Hint: Do simulations on a large sample.

6. (Optional) In 2-way contigency table (size $m \times n$), show that testing equality is equivalent to testing indepence. You need to show $H_0 : p_{1j} = p_{2j} = \cdots = p_{mj}$ for all j is equivalent to $H_0' : p_{ij} = p_{i\cdot} p_{\cdot j}$ (see my lecture note for notation).