Nonparametric Statistics Take-home Exam.

Due date: October 22 2:00pm. 1%/hour deduction afterward.

Submission Guideline: For Problem 2-4, you need to write a report about one page long for each problem detailing your hypotheses, assumptions, statistics and conclusions, etc. Justify every assumption and step you are taking. For instance, if you are assuming a certain distribution to solve the problem, verify it. When you attach computer codes, write some comments of what the codes are doing. There may be many solutions to the problems. Each problem is worth 5%. Partial grade will be given at 1% increment. For exceptional work, additional bonus points will be given.

1. When you graph qq-plot of $N(0, \sigma_1^2)$ vs. $N(0, \sigma_2^2)$, you will get a straight line. Determine the slope of the line as a function of σ_1 and σ_2. When $\sigma_1 = \sigma_2$, the slope becomes 1.

2. US unemployment monthly rate in percent is available for 20 years between 1970 and 1990. Is the unemployment rate increasing or decreasing over time? Is there any seasonal pattern in the unemployment rate? Justify any assumption you are making. The data file is at
http://www.stat.wisc.edu/∼mchung/teaching/data/unemployment.data.

3. Heights of singers in the NY Choral Society in 1979 are reported to the nearest inch. Voice parts in order from highest pitch to lowest pitch are Soprano, Alto, Tenor, Bass. The first two are female voices and the last two are male voices. Is the height of a singer related to his/her pitch? Justify any assumption you are making. The data file is at
http://www.stat.wisc.edu/∼mchung/teaching/data/singer.data.

4. Simon Newcomb measured the time required for light to travel from his laboratory on the Potomac River to a mirror at the base of the Washington Monument and back, a total distance of about 7400 meters. He obtained 66 measurements. Test if the speed of light is constant. What is the speed of light? Justify any assumption you are making. The data file is at
http://www.stat.wisc.edu/∼mchung/teaching/data/light.data.