STAT 740 - Spring 2004 - Homework 2

Due: Friday, February 13th

1) Modify the randu R code from in class to demonstrate a linear congruential generator with m=10 and full period of 10. Give the entire sequence in order.

2) In class we modified the randu R code to have a=10, c=0, and $m=2^{31}$. When plotting the resulting pairs of points they appeared to fall on very few actual points and we said it looked like the sequence had a very small period. Run this modified code with a variety of seeds. Why does it produce so few distinct values?

3) Create a program in Fortran or C to generate 500 pseudo-random variates that should follow the exponential distribution with mean=2, and write them to a file. Use the numerical recipes function ran2 to generate the uniform variables and change them to exponential variables using the probability integral transformation method. Read the resulting 500 variables into R and produce a q-q like plot to show that they do indeed seem to follow the appropriate distribution. (Note: If `x` is the sequence of values, then `pexp(sort(x),0.5)` will produce the ordered percentiles for the making the plot. The 0.5 is because of the way R parameterizes exponentials.)

4) Find a real data set (of at least 10 observations) that you might wish to perform a standard t-test about the mean on, but that fails to satisfy the assumption of normality. Give a reference and brief description of the data set.