CS 485 Assignment 2, due Feb. 10

1. We claimed that in the G(n,p) model the degrees of vertices were tightly concentrated about their expected degree and that real graphs such as airline route graphs did not fit the model. However, the degree distribution of an airline route graph might still fit the model with $p = \frac{d}{n}$. Look at some real world graphs with power law degree distributions and see whether or not they fit the G(n,p) model.

2. For d a constant $\lim_{n\to\infty}\left(1-\frac{d}{n}\right)^n = e^{-d}$. What happens if d is a function of n? For example what is $\lim_{n\to\infty}\left(1-\frac{\ln(n)}{n}\right)^n$? What about some other functions?

3. Develop a simple proof that as p increases the small components in G(n,p) of size two or greater disappear (merge into the giant component) before isolated vertices disappear.

4. Consider a random permutation of the integers 1 to n. Scan the permutation. How often do you encounter an integer greater than any seen so far?