Computer Science 2300: Homework 1

Due: February 11, 2010

Note: Please use rigorous, formal arguments. You will not receive full credit otherwise.

1. (10 points) [Based on a question from Cormen *et al*'s *Introduction to Algorithms*] Consider the following procedure for generating a permutation of the numbers $1 \ldots n$. First, choose an integer r uniformly at random between 1 and n. Now consider the array A with indices from 0 to $n-1$. Fill $A[i]$ with the number $i + r + 1$ if $i + r + 1 \leq n$ and with the number $i + r + 1 - n$ otherwise. First show that each number between 1 and n has a $1/n$ probability of winding up in any particular position in A. Then show that the resulting permutation in A is not uniformly random.

2. (10 points) Problem 0.3 (page 9) in DPV.

3. (10 points) Problem 1.4 (page 38) in DPV.

4. (10 points) Problem 1.19 (page 40) in DPV.

5. (10 points) Problem 1.21 (page 40) in DPV.