Department of Mathematics
Carnegie Mellon University

21-228 Discrete Mathematics, Fall 1999: Test 2

Name:______________________________________

Please circle your TA's name: Ojas Parekh Goran Konjevod

Problem	Points	Score
1	32	
2	34	
3	34	
Total	100	

No notes, tables, books, calculators can be used during the test!

Q1: (34pts) Let $m = n^4 + 1$. Given two sequences $a_1, a_2, \ldots, a_m$ and $b_1, b_2, \ldots, b_m$ of real numbers, show that there exist $i_1, i_2, \ldots, i_n$ such that *both* subsequences $a_{i_1}, a_{i_2}, \ldots, a_{i_n}$ and $b_{i_1}, b_{i_2}, \ldots, b_{i_n}$ are monotone.
Here we do not insist that both are monotone increasing or both are monotone decreasing, so one can be increasing and the other decreasing.

Q2: (33pts) A dice is rolled n times..

(a) What is the probability that it never comes up 3,4,5 or 6?

(b) What is the probability that the number of times the dice comes up even is odd.

(c) What is the probability that there are as many odd outcomes as there are even?

Q3: (33pts) A bag contains r red balls and b blue balls. A ball is drawn randomly from the bag and then replaced. Compute the expected number of drawings needed to get the first blue ball.