

Math 475 first midterm

12:05 - 12:55 pm, October 17, 2005

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NAME:

1. (20 points) My old monitor has 16 bit colors, in other words it is capable of displaying  $2^{16} = 65536$  different colors. Its resolution is  $600 \times 800$ , this is how many pixels (display points) it has. Find the smallest number  $k$ , for which the following statement can be true: "There are no more than  $k$  pixels of the same color."

2. (15 points) Among the 4-combinations of the set  $\{1, 2, 3, 4, 5, 6, 7, 8\}$ , find the one immediately preceding and the one immediately following  $\{2, 4, 6, 8\}$  in the lexicographic order.

3. Let  $S$  be the multiset  $S = \{C, O, M, B, I, N, A, T, O, R, I, C, S\}$ . (Same letters are considered indistinguishable.)

(a) (5 points) Find the number of permutations of  $S$ .

(b) (8 points) Find the number of permutations of  $S$  which contain the sequence MINI.

(c) (5 points) Find the number of permutations of  $S$  which contain the sequence ROBOT.

(d) (7 points) Find the number of permutations of  $S$  which do not contain either of the sequences MINI and ROBOT. *Be careful.*

4. (20 points) Determine the number of ways to place 3 identical red, 3 identical blue, and 2 identical green non-attacking rooks on the following board:

