

MATH 579 Exam 6; 3/22/12
Please read the exam instructions.

No books or notes are permitted for this exam; calculators are permitted though. Please indicate what work goes with which problem, and put your name or initials on every sheet. Cross out work you do not wish graded; incorrect work can lower your grade, even compared with no work at all. Show all necessary work in your solutions; if you are unsure, show it. Simplify all numerical answers to be integers, if possible. You have 40 minutes. If you wish, when handing in your exam you may attach your extra credit problem. For more details, see the syllabus.

Choose three problems only from these five.

1. (5-8 points) Let $\pi = (2\ 4)(1\ 5\ 3)$. Calculate and simplify $\pi \circ \pi \circ \pi$.
2. (5-10 points) Prove that $p(n)$ is equal to the number of partitions of $2n$ with no odd parts.
3. (5-10 points) Consider all partitions of 11. What is the maximal Durfee square? Give all partitions that yield this Durfee square.
4. (5-10 points) Consider $\pi \in S_n$. Prove that, for any such choice of π , that $|\det A| = 1$, for matrix A whose entries are given by $A_{i,j} = \begin{cases} 1 & \pi(i) = j \\ 0 & \text{otherwise.} \end{cases}$
5. (5-12 points) Prove that $\binom{n}{2} \geq (n-1)! + (n-2)!$, for all integer $n \geq 2$.