15-750: Graduate Algorithms	Manuel Blum, Virginia Vassilevska, Chris Wang
Midterm Exam 2	March 30, 2005

Name:

E-mail:

Instructions:

- This is a closed book exam. No calculators or laptops are allowed. Absolutely no collaboration.

- Do all your work including scratch work on the pages of this exam.

- There are 5 problems and 7 pages, including this page.

- The exam is graded out of 100 points. Not all answers listed are possible.

- If you use anything not proven in class, please provide a proof.

- In any reduction you may only use one of the following NP-complete problems: 3SAT, SAT, Clique, Independent Set, Vertex Cover, Hamiltonian Cycle, Hamiltonian Path, Graph Coloring, MAX-TSP, Set Cover, Partition

- You may use the Cook's Theorem.

- You should explain all your answers. However, we only ask for a rigorous proof in the second [45pts] questions.

1. (10pts) This will be a question identical to a problem in previous homeworks or midterm.

2. (45pts)

3. (15pts)

4. (15pts)

5. (15pts)

6. (Bonus 5pts)

7. (Bonus 5pts)

Happy April Fool's Day!