Theory of Computation

Final Examination on January 13, 2009

Problem 1 (25 points)**.** Show that if SAT $\in$ P, then FSAT has a polynomial-time algorithm. (Hint: You may want to use the self-reducibility of SAT.)

Problem 2 (25 points)**.** Let x be a random variable taking positive integer values. Show that for any $k > 0$, $\text{prob}[x \geq kE[\,x\,]] \leq 1/k$.

Problem 3 (25 points)**.** In the slides, we have shown a 2-round interactive proof system for GRAPH NONISOMORPHISM. Hence GRAPH NONISOMORPHISM is in IP. But is GRAPH ISOMORPHISM also in IP? Briefly justify your answer.

Problem 4 (25 points)**.** Show that if #SAT $\in$ FP, then P $=$ NP.