Homework 11 – Due Thursday, April 21, 2016 before the lecture

Please refer to the general information handout for the full homework policy and options. This homework contains 3 problems, worth 10 points each. *Your solution to each problem should be handed in on a separate sheet of paper.*

Reminder Collaboration is permitted, but you must write the solutions *by yourself without assistance*, and be ready to explain them orally to the instructor if asked. You must also identify your collaborators. Getting solutions from outside sources such as the Web or students not enrolled in the class is strictly forbidden.

Exercises Please practice on exercises and solved problems in Chapter 7 and on the following exercise. The material they cover may appear on exams.

1. (**PATH**) Sipser, 7.20.

Problems

1. (**DOUBLE-SAT**) Sipser, 7.22.
2. (**Minesweeper**) Sipser, 7.32.
3. (**Hamiltonian Path**) Read the reduction from *3SAT* to *HAMPATH* on page 314 of Sipser.
   (a) Is this construction also a valid polynomial-time reduction from *2SAT* to *HAMPATH*?
   (b) Draw the graph G that the reduction outputs on input formula $\phi = (\bar{x} \vee y) \wedge (x \vee \bar{y})$. For both satisfying assignments of ϕ, give a corresponding Hamiltonian path in G.
   (c) Draw the graph G that the reduction outputs on input formula $\phi = (x \vee y) \wedge (\bar{x} \vee \bar{y}) \wedge (\bar{x} \vee y) \wedge (x \vee \bar{y})$. Argue that G does not have a Hamiltonian path (not relying on the fact that we already proved that the reduction is correct).
   (d) Why would a polynomial-time reduction from *HAMPATH* to *2SAT* have surprising implications, but a reduction in the other direction does not?