

### Homework problems:

**9.1 (due Nov 9, 2006)** Suppose that you have a black-box which solves the MAX-WEIGHT MATCHING problem on any weighed graph  $G = (V, E, w)$  in time  $O(E + V)$ . Show how you can use the black-box to solve the MAX-WEIGHT PERFECT MATCHING problem in time  $O(E + V)$ .

**9.2 (due Nov 9, 2006)** Suppose that you have a black-box which solves the MAX-WEIGHT PERFECT MATCHING problem on any weighed graph  $G = (V, E, w)$  in time  $O(E + V)$ . Show how you can use the black-box to solve the MAX-WEIGHT MATCHING problem in time  $O(E + V)$ .

**9.3 (due Nov 9, 2006)** Suppose that you have a black-box which for any graph  $G$  answers whether  $G$  is 3-colorable or not. The black-box takes time  $O(1)$  to answer the queries.

Give an efficient algorithm which, for any 3-colorable input graph  $G$ , finds a 3-coloring of  $G$ . At the beginning of your solution clearly state:

- the (asymptotic) running time of your algorithm, and
  - the (asymptotic) number of queries made to the black-box.
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### Bonus problems:

**9.4 (due Nov 9, 2006)**

Let CLIQUE be the following problem:

INSTANCE: a graph  $G$  (given by an adjacency list), and a number  $k$

QUESTION: does the graph  $G$  have a clique of size  $\geq k$ ?

Suppose that you have a black-box that solves the CLIQUE problem in  $O(1)$ -time. Give an efficient algorithm which, for any input graph  $G$ , finds the maximum clique in  $G$ .

At the beginning of your solution clearly state:

- the (asymptotic) running time of your algorithm, and
- the (asymptotic) number of queries made to the black-box.