HOMEWORK #9, CPSC 421/501, FALL 2017

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Please note:

(1) **We may only mark a subset of the problems below, depending on time constraints; the solution set we provide will solve all of the problems below.**
(2) Proofs should be written out formally. **Your solutions should be explained: e.g., if we ask for a DFA, you should explain how it works, not merely produce a diagram of the DFA.**
(3) Homework that is difficult to read may not be graded.
(4) You may work together on homework, **you must write up your own solutions individually.** You must acknowledge with whom you worked (specify their `ugrad.cs.ubc.ca` email addresses). You must also acknowledge any sources you have used beyond the textbook and two articles on the class website.
(5) When you submit your homework to `gradescope.com`, you need to put the solutions to different problems on different pages; `gradescope.com` will ask you to identify which pages correspond to which problems. Please use the problem numbers below.
(6) Bonus questions count for marks above the 10% homework grade.

Homework Problems

(1) Let PARTITION be the language consisting of descriptions $\langle n_1, \ldots, n_m \rangle$ of elements $n_1, \ldots, n_m \in \mathbb{Z}$ such that there exists an $I \subset \{1, \ldots, m\}$ such that

$$\sum_{i \in I} n_i = \sum_{i \notin I} n_i.$$

Prove that PARTITION is NP-complete, by (1) arguing that PARTITION is in NP (this is similar to Theorem 7.25 in [Sip]), (2) giving a reduction from SUBSET-SUM to PARTITION, and (3) explaining why your reduction can be computed in polynomial time. [Make sure you address (1) and (3), not just (2).]

Research supported in part by an NSERC grant.

(2) Exercise 7.24 of [Sip].

(3) Exercise 7.29 of [Sip].

(4) Problem 4 of my Final Exam from December 2014 (i.e., Exercise 7.22 of [Sip]).

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