

HOMEWORK #4, CPSC 421/501, FALL 2017

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Please note:

- (1) Proofs should be written out formally.
- (2) Homework that is difficult to read may not be graded.
- (3) 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.
- (4) 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 (1)–(7) below.
- (5) Bonus questions count for marks above the 10% homework grade.

- (1) Problem 1.6 of [Sip], parts (e,h,j).
- (2) Write a DFA that accepts the following languages over $\{0, 1\}$:
 - (a) the set of strings that, when viewed as integers written in binary, represent integers divisible by 3 (leading 0's are OK);
 - (b) the set of strings that, when viewed as integers written in binary, represent integers divisible by 4 (leading 0's are OK);
 - (c) the set of strings that, when viewed as integers written in binary, represent integers divisible by 5 (leading 0's are OK).
- (3) A real number is *algebraic* if it satisfies an equation $p(x) = 0$ where p is a nonzero polynomial with integer coefficients. Prove that the number of algebraic numbers countable.

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Research supported in part by an NSERC grant.