MA/CSSE 474 Homework #9 72 points Updated for Summer, 2018

General hint: If it is very difficult to find a way to make the pumping theorem work for a given language that appears to be non-regular, consider the possibility that the language might actually be regular.

- 1. 8.8
- 2. (t-3-6) 8.8 de
- 3. (t-9) 8.9 This is a difficult problem. Begin thinking about it a few days before it is due.
- 4. (t-9) 8.10-a I.e., given a DFSM M = (K, Σ , δ , s, A) such that L(M)=L, construct a DFSM M*=(K^* , Σ , δ^* , s^* , A^*) such that L(M*)=maxstring(L).
- 5. (t-6) 8.16a (this one is a little bit "logically tricky")
- 6. 8.16b
- 7. 8.21 (I like to put questions like these on exams)
- 8. (t-12) 8.21n (this is a nontrivial problem)
- 9. (t-3) 8.210
- 10. 9.1 You can assume (and use without giving the details of the algorithms) any algorithms and decision procedures from chapter 9 or previous chapters.
- 11. (t-6) 9.1b See note below.
- 12. (t<mark>-6</mark>) 9.1d
- 13. (t-6) 9.1g. See note below.
- 14. (<mark>t-6</mark>) 9.1i

<mark>9.1g</mark>:

There is a small error in the statement of the problem. a^* should be $\{a\}^*$

<mark>9.1</mark>b:

Note that |L(M)| means "the number of elements in the language accepted by the machine M. Note that for some machines M, the language is countably infinite.

Previous questions and answers from Piazza:

General question: Is every Nonregular language countable in size? A Every language is countable (I.e. it is finite or countably infinite, because Σ is finite.

General question: Can we assume we know how to check if there are loops in a DFSM as the books assumes? **A** Yes. Unless a problem specifically states otherwise, for decision procedure problems, you may assume anything that is in an result in the book, the homework, or a class example or exercise.

Question on #8: I'm stuck on how to prove this one. Any particular rule I should be using,,,?

Hint 1: It's true. All of the credit is for showing that.

Hint 2: I am not sure how you could show this except by construction. I.e., describe how, given any non-regular language L, we can construct an infinite set T of regular languages, such that the intersection of all of the languages in T is exactly the set L.

Hint 3: The notion of "complement of a language" can be useful here.