

Math 385 Exam 2 review

You should be able to give formal definitions for the following, and, given a particular example, explain how it matches up with the formal definition.

- Context free grammar
- Ambiguous grammar
- Inherently ambiguous language
- Chomsky normal form
- Greibach normal form
- String generated by a grammar
- Language generated by a grammar
- Pushdown automaton
- String accepted by a pushdown automaton
- Language accepted by a pushdown automaton
- Deterministic pushdown automaton

You should be able to do the following

- Construct a context-free grammar or a pushdown automaton for a specified language (up to a reasonable level of complexity)
- Remove useless productions, λ productions, and $A \rightarrow B$ productions from a CFG.
- Given a derivation for string from a grammar, draw the derivation tree or create the equivalent leftmost derivation.
- Find a derivation for a word given a grammar (that generates the word).
- Convert a grammar to Chomsky normal form.
- Given a context free grammar, construct a pushdown automaton that accepts the same language.
- Given a context free grammar and the pushdown automaton constructed from it, match a acceptance path in the automaton for a string to a derivation for the same string. (I expect you to understand how the proof of equivalence works even though I don't expect you to be able to write it down formally.)
- Given a pushdown automaton, construct a context free grammar that generates the same language
- Given a pushdown automaton and the context free grammar constructed from it, match a acceptance path in the automaton for a string with a derivation for the same string. (I expect you to understand how the proof of equivalence works even though I don't expect you to be able to write it down formally.)
- Prove that a given language is not regular (probably by using the pumping lemma).
- Use the major closure properties to show that a given language is or (by contradiction) is not regular.
- Use the major closure properties to show that a given language is context free.

Relevant problems in the book with solutions in the back:

- 4.3: 4ae, 5a, 15ab
- 5.1: 4, 7ad, 8ae, 13a, 20, 23

- 5.2: 6, 14
- 6.1: 3, 8, 15, 17
- 6.2: 5, 12
- 7.1: 4af, 9, 11, 16
- 7.2: 3, 4, 7
- 7.3: 4, 9, 11
- 8.2: 5, 21