Review of material covered since midterm exam

Book lectures covered: 19-23, E, 24-25, F, 26-32, 36-37, I

19: context-free grammars, context-free languages, pushdown automata

20: PAREN

21: removal of ϵ- and unit productions, Chomsky Normal Form, Greibach Normal Form

22: pumping lemma for CFLs

23: pushdown automata, formal definition, configurations, acceptance by final state or by empty stack

E: final state acceptance and empty stack acceptance are equivalent

24: relation between pushdown automata and CFLs

25: direct connection between CFGs and NPDAs with one state, simulation of NPDAs with multiple states

F: deterministic pushdown automata, why they are less powerful than NPDAs, complement of DCFLs

26: parsing, bottom-up parsing, expression trees, operator precedence, ambiguous grammars, unambiguous grammars

27: Cocke-Kasami-Younger algorithm, closure properties of CFLs, DCFLs

28: Effective computability, Turing machines, configurations, acceptance

29: examples, recursive sets, r.e. sets, decidability, semidecidability

30: machines with multiple tapes, Turing machines with multiple tracks on one tape, two-way infinite tapes, machines with two stack, enumeration machines, the equivalence of all these machines

31: universal Turing machines, halting problem, diagonalization, membership problem, reduction

32: more examples of decidable and undecidable problems, constructing machines that solve the halting problem or other undecidable problems

36: Post systems, Type 0 grammars, type 1 grammars, context-free grammars, primitive recursive functions, μ-recursive functions

37: λ-calculus, Church numerals, combinatory logic

I: the **while** programming language, semantics of **while** programs, relationship to primitive recursive and μ-recursive functions