Review of material covered before midterm exam

Book lectures covered: 1-16, A, 17, 18

1: not much here

2: review of strings and sets, concatenation, set operations: union, intersection, complement, set concatenation, powers, asterate

3: formal definition of deterministic finite automaton (DFA), language of a DFA, regular sets

4: closure properties of regular sets: union, intersection, complement, concatenation, asterate; product of two DFAs

5: nondeterministic finite automata (NFA), subset construction of an equivalent DFA from an NFA, do it without constructing unreachable states

6: Formal definition of NFAs, the subset construction, Thm: an NFA and the DFA constructed from it accept the same set of strings, ϵ-transitions, proof that concatenation preserves regularity

7: patterns; atomic: letters in Σ, ϵ, $\emptyset$, #, @; compound patterns: $+$, $\cap$, $\cdot$ (concatenation), $\sim$, *, (,), the languages of patterns, pattern matching

8: regular expressions: patterns restricted to letters in Σ, ϵ, $\emptyset$, $+$, $\cdot$, *, (,), Thm: the languages of DFAs, patterns and regular expressions are all the same

9: simplification of regular expressions (pp. 49,50,57), construction of regular expression for the language of a DFA or NFA using $\alpha^X_{u,v}$ (pg. 52)

A: Kleene algebra: pages 55-top three lines of 58; skip from matrices onward

10: homomorphisms, use to show other sets are regular, use to reduce NFAs with ϵ-transitions to NFAs without ϵ-transitions; skip Hamming distance

11: not all sets are regular, Pumping lemma, especially the contrapositive version

12: using the pumping lemma to show a set is not regular, ultimate periodicity

13: minimization of DFAs, quotient construction of $M/\approx$ from M and $\approx$, Thm:$L(M'/\approx) = L(M)$

14: a minimization algorithm; computing $\approx$ relation, $M/\approx$

15: Isomorphism, Myhill-Nerode relations for a set R; right congruence, refinement of R, finite index, $\equiv_M$, $M_\equiv$

16: Myhill-Nerode theorem, use to show whether a set is regular or not

17: Two-way deterministic A, finite automata(2DFA), formal definition, configurations, the next relation ($\xrightarrow[x]{1}$), other binary relations, $\xrightarrow[x]{n}$, $\xrightarrow[x]{*}$

18: Tables T_x for showing the state of a 2DFA as it moves its head left and right across the right boundary of string x, the equivalence relation I called $\equiv_T$, construction of a DFA from the tables (two ways), showing that 2DFAs accept only regular sets