Final Topics- THIS IS TWO PAGES LONG
REGULAR

1. DFA's, NFA's, REGEX and their equivalence to each other:

    (a) If L is recognized by an NFA then L is recognized by a DFA (powerset construction). So NFA $\subseteq$ DFA. Trivially DFA $\subseteq$ NFA so this gives NFA = DFA.

    (b) REGEX $\subseteq$ NFA. Given a REGEX we can build an NFA of it by induction on the length of the REGEX.

    (c) DFA $\subseteq$ REGEX. This is the $R(i, j, k)$ method.

2. Applications of Regular Languages.

    (a) Easy DFA's: number of a's $\equiv a \pmod{b}$, set of strings that begin with a certain prefix, end with a certain suffix.

    (b) DFA Classifiers for tricks for division (e.g., the DFA classifier that gives the remainder when dividing by 7).

    (c) Decidability of WS1S.

3. Proving languages NOT regular

    (a) Pumping Lemma

    (b) Using Closure

    (c) Small NFA's for Unary Languages

    TO GO NExT PAGE!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

P AND NP

1. Turing Machines. Not the details of them, but know that they can be used to list out P and other classes.

2. Definition of P and NP and NP-completeness

3. Reductions (Study all of them that we did.)

4. Cook-Levin theorem

5. There is a decidable language not in P

6. Languages that are in NP but thought to NOT be NP-complete (I will do this Tuesday May 8)

Decidability and Undecidability

1. Showing that some set or function is decidable (the last HW).

2. HALT is undecidable (NOT the proof, but the fact that it is)

3. Busy Beaver Function - know that it grows faster than any computable function (if it didn't then could decide HALT).

4. Know other undecidable sets (NOT the proof that they are undecidable)

Notes and Advice

1. Context Free Grammars and languages NOT on the final.

2. PROOF that HALT is undecidable NOT on the final.

3. As usual your best guide is to do or redo the HW from this class, look at the solutions, make up your own problems to do.

4. Last years exam is OKAY to look at but there may be some things I did then but now now or vice versa so don't go into a panic (I've seen students do this) because there is something on it that looks odd. You can always ask me.

5. DO NOT try to memorize your way through the course. You need UNDERSTANDING.

6. You can bring in a sheet of notes 8.5 by 11, you can use both sides.