CSE 20 review sheet

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Disclaimer: This list of topics is just provided to help students get organized for reviewing. I do not guarantee that it contains all topics on the final. You are responsible for all the reading listed on the schedule page.

List of topics:

Logic

- Propositional: $\vee$, $\wedge$, $\sim$, logical equivalences, basic digital logic (circuit diagrams), rules of inference, valid argument forms.

- Predicate: $\forall$, $\exists$, $\exists\forall$, $\forall\exists$, negation of all of the above, universal instantiation, vacuous truths, argument forms.

Proof techniques:

- Direct: Prove $\forall$ by generalizing from a generic particular. Prove $\exists$ or $\sim \forall$ with example, counter-example, respectively.

- Contraposition: for universal conditional statements.

- Contradiction.

- Induction.

Number theory:

- Divisibility.

- Primality.

- Rationality.

- mod, div.

- GCD, Euclidean alg.

- Quotient Remainder theorem and division into cases.

- Parity (even or odd)

- floor, ceiling.

Sequences:

- Change of variable.

- Separating out terms, and other manipulations.

- Summations and products.

- Particular summations we learned, e.g. sum of first n integers.

Set theory:

- Set relations: $\subseteq$, $=$, and proper subset.
- Set operations: $\cup$, $\cap$, $-$, A^c.
- Venn diagrams.
- The empty set: ϕ, and proving a set is empty.
- Set partitions, power sets, Cartesian products.
- Proofs using the element method.
- Set identities, and algebraic proofs using them.
- Russell's paradox and the Halting problem.

Relations:

- Definition of relation on sets.
- Arrow diagrams.
- Reflexive, Symmetric and Transitive.
- Equivalence relations: proving a relation is an equivalence relation, the relation induced by a set partition, equivalence classes of an equivalence relation.
- Congruence $\mod n$.

Functions:

- Definition of a function.
- Arrow diagrams.
- One-to-one, onto, bijection, and proving all of the above. Inverse functions.
- Composition of functions.
- Pigeonhole principle.
- Cardinality.
- Countability.

Misc.

- Number systems: base 10 (decimal), and base 2 (binary), and how to convert between them.