

Study guide for second CS160 midterm exam

This is a study guide for the second midterm, more detailed information can be found in the slide sets and homework assignments. Before the midterm we will present a slide set that reviews propositional and predicate logic.

1) Sets

- a. Set Membership
- b. Set Notation
- c. Subset and Proper Subset
- d. Empty Set
- e. Union Operation
- f. Intersection Operation
- g. Difference Operation
- h. Set Complement
- i. Set Cardinality
- j. Set Identities
- k. Cartesian Product
- l. Power Sets
- m. Set Builder Notation
- n. Venn Diagram
- o. Common Sets (\mathbb{N} , \mathbb{Z} , \mathbb{Z}^+ , \mathbb{R} , \mathbb{R}^+)

2) Functions:

- a. Domain, Codomain, Range
- b. 1:1 Functions
- c. (Strictly) Increasing Functions

3) Propositional Logic

- a. What is and is not a proposition
- b. Truth Tables
- c. Logical Negation
- d. Logical Conjunction (and)
- e. Logical Disjunction (or, xor)
- f. Unidirectional Implication
- g. Bidirectional Implication

h. Compound Propositions

- i. Tautology, Contradiction, Contingency
- j. Logical Equivalences
- k. Inference Rules (Understand not Memorize!)
- l. Proofs using Truth Tables
- m. Proofs using Inference Rules

4) Predicate Logic

- a. Notation
- b. Universal Quantifier (for all)
- c. Existential Quantifier (there exists)
- d. English to Logic and vice versa
- e. Figure out if true or false
- f. Provide example or counterexample

5) Program Proofs

- a. Pre-Conditions
- b. Post-Conditions
- c. Loop Invariants

6) Math Proofs

- a. Notation
- b. Direct Proofs
- c. Contrapositive Proofs
- d. Proof by Contradiction
- e. Proof by Cases