Appendix A from the textbook

You need to read this appendix and complete the quiz (sent in a previous email) before you come to class on Day 1.

The Rich book has help for you in Appendix A (Sections 1-7, about 45 pages). Appendix A is a review of the Mathematics needed to understand this textbook. I suggest that you read it carefully before the course starts. Almost all of this appendix should be things that you saw in Disco I & 2 courses. But there may be some things that were not emphasized by your instructor or that did not stick in your long-term memory. And it is good to get into this author's use of terminology, etc. before reading the book. Pay special attention to the section on proof techniques.

The contents of that appendix are approximately the background that I expect you to have as you come into this course. We will spend a little bit of time at the beginning of the course reviewing some highlights of Appendix A. When you look carefully at Appendix A before the course starts, if there is a lot of material that is new or hazy to you, spend significant time on it before the course begins or during the first few days.

In this course you will be doing a number of proofs, including proofs by induction. If your previous courses did not bring you to a high comfort level with writing inductive proofs, I especially recommend that you work on that before the course begins. Many of the other proof techniques from Appendix A will be useful for the course also, so you should review all of them.

To give you an idea of whether you need to review in order to be able to get a good start in the course, I am listing some of the topics from Appendix A. If a few of them are fuzzy or unfamiliar, a little extra work after the term starts should suffice to catch you up

- Logic
  - Boolean propositional logic
    - Well-formed formulas and propositions
    - Truth tables
    - Axioms and proofs
    - Modus ponens, modus tolens
  - First-order logic
    - Predicates, terms, expressions, free and bound variables,
    - Universal and existential quantifiers
    - Interpretations and models; valid, satisfiable, and unsatisfiable formulas
    - Quantifier exchange, universal instantiation, existential generalization Sets
  - Enumeration of a set
  - Finite, countable, and uncountably infinite sets
  - Subset, intersection, union, difference, power set
  - Partitions of a set
- Relations
  - Cartesian product of two sets
  - Inverse of a relation, graph of a relation
  - Reflexive, transitive, symmetric, antisymmetric, equivalence relation, equivalence classes

- Orderings and partial orderings

Functions

- Domain, range, arity, total and partial functions
- Commutativity, associativity, distributivity, identity, inverse elements
- One-to-one and onto functions

Closures

- What it means for a set to be closed under a property
- Transitive and reflexive closures
- Closure under functions

Proof techniques.

- Proof by:
    - Construction
    - Contradiction
    - Counterexample
    - Case Enumeration
    - Mathematical induction
    - Pigeonhole principle
- Showing that two sets are equal
- Showing that a set is finite or countably infinite
- Diagonalization: Showing that a set is uncountable (this is not a prerequisite for 474)
- Analyzing complexity (big-O and its cousins)

You should also read pages xii-xv in the preface.

The first reading assignment over new material after the course starts: You should read Chapters 1 and 2 (both are very short) on the first day of the course (or before that).