

## MA383 - Foundations in Mathematics WPR 2 Topic List

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- **Sets** - Chapter 4, Sections 1-4
  - Basics:  $A \cap B$ ,  $A \cup B$ ,  $A - B$ ,  $A^c$ ,  $\emptyset$ ,  $U$ ,  $\mathcal{P}(A)$ ,  $|A|$
  - Set Notation:  $\in$ ,  $\subseteq$ ,  $\subset$
  - Venn Diagrams
  - Proofs - How to prove  $A \subseteq B$ ,  $A = B$ , and  $A$  and  $B$  are disjoint
  - Set algebra and properties (Lesson 20, Section 4.3)
  - Cartesian products
  - **Practice Problems:** 4.1 (7,8,12,13), 4.2 (9,10,11,13), 4.3 (2,4,5,10), 4.4 (1), HW 5, Lesson 21 sets review worksheet
  
- **Induction** - Chapter 5, Section 1 and 3
  - What types of results are well suited for proofs by induction?
  - What is the framework for a proof by induction?
  - Induction proofs on results about: summations, factorials, inequalities, division, or other familiar concepts
  - Using induction to prove results about sequences that are defined recursively (e.g. the Fibonacci numbers or others)
  - **Practice Problems:** 5.1 (3,6,11), 5.3 (5a-f,7,11), HW 6, Lesson 23 induction practice worksheet
  
- **Functions** - Chapter 6, Sections 1-6
  - What is a function? (Be comfortable using those defined via formulas, descriptions in words, arrow diagrams, including the examples we talked about in class or that were seen in homework)
  - Basics: domain, codomain, range/image; image and preimage of elements
  - What does it mean for two functions to be equal?
  - What are injective, surjective and bijective functions? What is the strategy of proof for each?
  - Composition of functions: How is this defined? What are the domain and codomain? How can you decompose a composition?
  - What is an inverse function? When are you guaranteed that one exists? How can you find it?
  - Image and preimage of a set (including definitions and notation)
  - How do intersections and unions behave under images and preimages of functions?
  - **Practice Problems:** 6.1 (3a-c,5,6,7), 6.2 (1,5,6), 6.3 (1,4,10,11,13b,14b), 6.4 (2,3,6), 6.5 (7,10,12), 6.6 (1,5-9), HW 7, Lesson 31 class worksheet