Math 311
Exam 2 Review Sheet

Mathematical Induction

• Know the definition of a sequence along with standard sequence notation.
• Understand both explicitly and recursively defined sequences and be able to use them to write out the first few terms in a sequence.
• Understand summation notation and be able to compute summations.
• Understand the principle of mathematical induction and why it is a valid method of proof.
• Be able to prove the base case of a set of statements of the form $P(n)$ for all $n > 0$
• Be able to prove theorems using mathematical induction and strong induction.
• Be able to recognize errors in false induction "proofs".

Sets

• Understand the definitions of sets, elements, subsets, as well as symbolic notation for these terms.
• Understand both roster and set builder notation, and be able to determine whether a given set is well defined.
• Understand the definition of set equality and the definition of the cardinality of a set.
• Understand the definitions of the universal set, the empty set, and the power set of a set.
• Understand how to form the Cartesian Product of two sets.
• Understand the definition of the set operations: union, intersection, complementation, and set difference.
• Be able to determine which elements are in a set resulting from multiple set operations. Also be able to draw a Venn diagram representing such a set.
• Be able to prove statements and properties of sets using containment arguments.
• Understand how to take the union or the intersection of many sets at the same time (including infinite unions and intersections).

Functions

• Understand the definition of a function, including the definition of the domain, co-domain, and range of a function and be able to apply these definitions to specific functions. Also know how to find the implicit domain of a function.
• Understand and be able to apply the definitions of image and preimage (for both individual elements and sets of elements).
• Understand the definition of function equality and be able to determine whether or not a pair of functions are equal.
• Understand the definition of the graph of a function, and be able to draw the graph of a given function.
• Know the definition of a polynomial function, including the degree of a polynomial.
• Know and be able to apply the definition of the identity function on a set.
• Understand the definition of function composition and be able to find composite functions and to prove facts about composite functions.
• Know the definition of one-to-one and onto, and be able to determine whether or not a given function satisfies these definitions.
• Understand the definition of an inverse function, know the properties that a function must satisfy in order to have an inverse, and be able to find the inverse of a function or to determine whether or not a given pair of functions are inverses.