

Section 2.1 - Sets

- Understand the definitions of sets, elements, subsets, and proper 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, singleton sets, and the power set of a set.
- Understand Venn diagrams and how they can be used to depict the relationships between different sets.
- Understand how to form the Cartesian Product of two sets.

Section 2.2 - Set Operations

- Understand the definition of the set operations: union, intersection, complementation, and set difference.
- Understand what it means for two sets to be disjoint, and know how to compute the cardinality of the union of two sets using the inclusion-exclusion formula.
- 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.
- Know the basic set identities (set equalities) and be able to prove them using membership tables, two-column proofs, and paragraph (double containment) proofs.
- Understand how to take the union or the intersection of more than two sets at the same time.
- Understand how to represent sets as binary strings and know how to carry out set operations on binary strings.

Section 2.3 - Functions

- Understand the definition of a function, including the definition of the domain, co-domain, and range of a function.
- Understand and be able to apply the definitions of image and preimage (for both individual elements and sets of elements).
- 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 function addition, subtraction, multiplication, division and composition and be able to prove facts about the results of applying these operations to a pair of functions.
- Understand the definition of an inverse function and know the properties that a function must satisfy in order to have an inverse.
- Understand the definition of the graph of a function, and be able to draw the graph of a given function.
- Know the definition of the floor function and the ceiling function and be able to apply this definition to investigate the graphs and/or properties of related functions.

Section 2.4 - Sequences and Summations

- 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.
- Be able to determine whether or not a sequence satisfies a given recurrence relation.
- Be able to find a recurrence relation that represents an explicitly defined sequence.
- Be able to find an explicitly defined sequence that is a solution to a given recurrence relation.
- Understand summation notation and be able to compute both single and double summations.

Sections 5.1 - Mathematical Induction

- 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.
- Be able to recognize errors in false induction “proofs”.