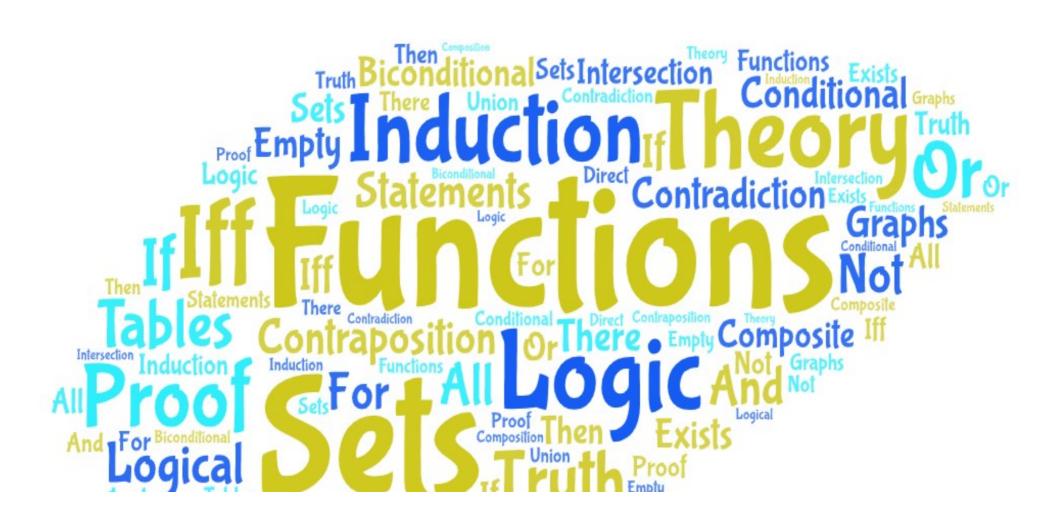
Lecture Thursday Week 5

Discrete Mathematics and Probability 2024



There **is** a lecture next week, namely on Thursday, after the class test has been submitted. It introduces material from Week 7, on discrete probability. There is no lecture on Monday.

Discrete Math: Covered material

- * Week 1 (16 Sept; self study): Epp Chapter 1: Speaking Mathematically
 - Variables; Languages of Sets, of Relations and Functions, of Graphs.
 - Chapter 2: Logic of compound statements
 - 2.1 Logical Form and Logical Equivalence
 - 2.2 Conditional Statements
 - Chapter 3: The logic of Quantified Statements: All except 3.4, which was covered in Inf1A.
- * Week 2 (19 & 23 Sept): Chapter 4: Elementary number theory and methods of proof.
 - Skip Section 4.9 and 4.10 (or 4.8 in the 4th edition)
 - Direct proof, proof by cases, by contradiction and by contraposition
- * Week 3 (26 & 30 Sept): Chapter 5: Induction and Recursion Skip 5.1 (you know this already), skip 5.7-5.9
 - 5.1 and 5.6 (self study): recursively defined sequences, sum notation; n! and "n choose r".
 - **5.2-5.4**: Proof by induction, and by strong induction.
- * Week 4 Chapter 6: Set theory (treated on 30 Sept), without 6.4
 - Basic operators on sets; Venn diagrams; proving set inclusion by element method, and by algebraic method.
 - Chapter 7: Functions Domain and co-domain; range of a function.
 - (3 Oct): Injective, surjective and bijective function. The inverse of a bijective function.
 - (7 Oct): Composition of functions. Comparing infinite sets by size. Countably inf., countable, uncountable sets.
 - The set of integers, as well as the rationals, are countable. The reals are uncountable.
 - Having the same size is an equivalence relation on sets.
 - Having a smaller or equal size (defined with injections) is a relation on sets that is reflexive and transitive, and if two sets are smaller or equal in size to each other, they must have the same size.
- * Week 5 (10 Oct): Chapter 8: Relations
 - (14 Oct): 8.4: Modular arithmetic and cryptography.

Discrete Math: Covered material

- * Week 1 (16 Sept; self study): Epp Chapters 1-3:
 - Variables; Sets, Relations Functions, Graphs; Logic, Conditional Statements, Quantified Statements.
- * Week 2 (19 & 23 Sept): Chapter 4: Elementary number theory and methods of proof.
 - Direct proof, proof by cases, by contradiction and by contraposition
- * Week 3 (26 & 30 Sept): Chapter 5: Induction and Recursion Skip 5.1 (you know this already), skip 5.7-5.9
 - 5.1 and 5.6 (self study): recursively defined sequences, sum notation; n! and "n choose r".
 - **5.2-5.4**: Proof by induction, and by strong induction.
- * Week 4 Chapter 6: Set theory (treated on 30 Sept), without 6.4
 - Basic operators on sets; Venn diagrams; proving set inclusion by element method, and by algebraic method.

Chapter 7: Functions

- (3 Oct): Injective, surjective and bijective function. The inverse of a bijective function. Domain and co-domain. Range of function.
- (7 Oct): Composition of functions. Comparing infinite sets by size. Countably inf., countable, uncountable sets. Having the same size is an equivalence relation on sets.
- * Week 5 (10 Oct): Chapter 8: Relations
 - Binary relations; domain and co-domain; 2 kinds of graphs of a relation; inverse of any relation.
 - N-ary relations. Reflexivity, symmetry and transitivity of binary relations with domain=co-domain.
 - Equivalence relations, equivalence classes, representative of an equivalence class.
 - Each equivalence relation induces a partition, and each partition induces an equivalence relation.
 - Partial orders. Anti-symmetry. Hasse diagram.
 - (14 Oct): 8.4: Modular arithmetic and cryptography
 - Inverse of a number modulo n. Solving diophantine equations.
 - RSA cryptography.

