MA291: Introduction to Higher Mathematics

Baker University — Spring 2024

Each of the following refers to the corresponding section(s) from *Mathematical Proofs: a Transition to Advanced Mathematics* (Fourth Edition) by G. Chartrand, A.D. Polimeni, and P. Zhang.

Exam 1: Sets, Relations, and Functions

date	day	section(s)	topic(s)
1/29	M	§1.1: Describing a Set §1.2: Subsets	∘ set membership ∘ set notation ∘ subset containment
1/31	W	§1.3: Set Operations	∘ union ∘ intersection ∘ complement
2/2	F	§1.4: Indexed Collections of Sets §1.5: Partitions of Sets	∘ union ∘ intersection ∘ disjoint sets

date	day	section(s)	topic(s)
2/5	M	§1.6: Cartesian Products of Sets §9.1: Relations §9.2: Properties of Relations	∘ cardinality ∘ reflexivity ∘ (anti)symmetry ∘ transitivity
2/7	W	§9.3: Equivalence Relations §9.4: Properties of Equivalence Classes	∘ equivalence classes ∘ modulo operation ∘ canonical partitions
2/9	F	§9.5: Congruence Modulo n	∘ remainder modulo n ∘ reduction modulo n ∘ modular arithmetic

date	day	section(s)	topic(s)
2/12	M	§10.1: The Definition of a Function	∘ relations ∘ domain ∘ range
2/14	W	§10.2: One-to-One and Onto Functions §10.3: Bijective Functions	∘ injectivity ∘ surjectivity ∘ bijectivity
2/16	F	§10.4: Composition of Functions §10.5: Inverse Functions	∘ function composition ∘ function inversion ∘ examples of function inverses

date	day	section(s)	topic(s)
2/19	M	Exam 1 Review	
2/21	W	Exam 1 Review	Exam 1 Practice Test
2/23	F	**Exam 1**	∘ Chapter 0: Communicating Mathematics ∘ Chapter 1: Sets ∘ Chapter 9: Equivalence Relations Omit §9.6: The Integers Modulo n. ∘ Chapter 10: Functions

Exam 2: Logic and Truth Tables

date	day	section(s)	topic(s)
2/26	M	§2.1: Statements	∘ variable ∘ domain ∘ truth value
2/28	W	§2.2: Negations §2.3: Disjunctions and Conjunctions	∘ not, $\neg$ ∘ or, $\wedge$ ∘ and, $\vee$
3/1	F	§2.4: Implications §2.5: More on Implications	∘ "if-then" statements ∘ implies, $\Longrightarrow$ ∘ "only if" statements ∘ converse, $\Longleftarrow$

date	day	section(s)	topic(s)
3/4	M	§2.6: Biconditionals	∘ "if and only if" ∘ biconditional, $\Longleftrightarrow$
3/6	W	§2.7: Tautologies and Contradictions §2.8: Logical Equivalence §2.9: Fund'l Prop'ties of Logical Equivalence	∘ truth tables ∘ equivalence, $\equiv$
3/8	F	§2.10: Quantified Statements	∘ for all, $\forall$ ∘ exists, $\exists$ ∘ uniqueness, !

date	day	section(s)	topic(s)
3/11	M	Exam 2 Review	
3/13	W	Exam 2 Review	Exam 2 Practice Test
3/15	F	**Exam 2**	∘ Chapter 2: Logic Omit §2.11: Characterizations.

Exam 3: Basic Proof Techniques

date	day	section(s)	topic(s)
3/25	M	§3.1: Trivial and Vacuous Proofs §3.2: Direct Proofs	∘ trivial truth ∘ vacuous truth ∘ truth tables ∘ examples
3/27	W	§3.3: Proof by Contrapositive	∘ contrapositive ∘ truth tables ∘ examples

date	day	section(s)	topic(s)
4/1	M	§3.4: Proof by Cases	∘ parity ∘ proof strategies
4/3	W	§5.1: Counterexamples §5.2: Proof by Contradiction	∘ contradiction ∘ truth tables ∘ examples
4/5	F	§5.4: Existence Proofs §5.5: Disproving Existence Statements	∘ truth tables ∘ proof strategies ∘ examples

date	day	section(s)	topic(s)
4/8	M	Exam 3 Review	
4/10	W	Exam 3 Review	Exam 3 Practice Test
4/12	F	**Exam 3**	∘ Chapter 3: Direct Proof and Proof by Contrapositive Omit §3.5: Proof Evaluations. ∘ Chapter 5: Existence and Proof by Contradiction

Exam 4: Proofs in the Wild

date	day	section(s)	topic(s)
4/15	M	§6.1: Principle of Mathematical Induction §6.2: General Principle of Mathematical Induction §6.3: Strong Principle of Mathematical Induction	∘ well-ordering ∘ base case ∘ inductive step ∘ examples
4/17	W	*Scholars Symposium*	
4/19	F	§4.1: Proofs Involving Divisibility of Integers §12.1: Divisibility Properties of Integers	∘ divisibility ∘ parity ∘ proof strategies ∘ examples

date	day	section(s)	topic(s)
4/22	M	§4.4: Proofs Involving Sets §4.5: Fund'l Prop'ties of Set Operations	∘ set containment ∘ set equality ∘ DeMorgan's Laws ∘ examples
4/24	W	§13.1: Multiplication / Addition Principles	∘ tasks ∘ pairwise disjoint ∘ examples
4/26	F	§13.3: The Pigeonhole Principle	∘ ceiling function ∘ examples

date	day	section(s)	topic(s)
4/29	M	§13.4: Permutations and Combinations	∘ ordered lists ∘ unordered lists ∘ examples
5/1	W	Exam 4 Review	
5/3	F	Exam 4 Review	Exam 4 Practice Test

date	day	section(s)	topic(s)
5/6	M	**Exam 4**	∘ §6.1: Principle of Mathematical Induction ∘ §6.2: General Principle of Mathematical Induction ∘ §6.3: Strong Principle of Mathematical Induction ∘ §4.1: Proofs Involving Divisibility of Integers ∘ §12.1: Divisibility Properties of Integers ∘ §4.4: Proofs Involving Sets ∘ §4.5: Fundamental Properties of Set Operations ∘ §13.1: The Multiplication and Addition Principles ∘ §13.3: The Pigeonhole Principle ∘ §13.4: Permutations and Combinations
5/8	W	Final Exam Review	
5/10	F	Final Exam Review	Final Exam Practice Test

Our **final exam** will be held Thursday, May 16 from 8:30 AM to 11:30 AM in Case TBD.