Math 2155, Fall 2021: Final exam info

The final exam is on Tuesday, December 21, from 7pm until 10pm.

Final exam info session: Wednesday, December 8, 10:30-11:20, usual Zoom link. It will be recorded.

Two new **WeBWorK** practice sets are now available.

A **list of practice problems** from the text is on the OWL site.

The final exam is cumulative, but will focus on Chapters 4, 5, 6 and 7. It will mostly test Chapters 1, 2 and 3 by using material from the later chapters.

Coverage summary:

Chapter 1: Sentential Logic.

Chapter 2: Quantificational Logic.

Chapter 3: Proofs.

Chapter 4: Relations. We did **not** cover 4.4.9, 4.4.10, 4.4.11, 4.5.6, 4.5.7, 4.5.8.

Chapter 5: Functions. Just 5.1, 5.2 and 5.3.

Chapter 6: Mathematical Induction. Just 6.1, 6.3, 6.4.

Chapter 7: Number Theory. Just 7.1, 7.2, 7.3. We did **not** cover the extended Euclidean algorithm (in 7.1), least common multiples (lcm) (end of 7.2), or solving congruences (end of 7.3).

Coverage (still only lists the highlights):

Chapter 1: Sentential Logic.

Logic: And, or, not, implies, truth tables, equivalences (like de Morgan), translating between English and logic, converse, contrapositive, tautology, contradiction.

Set theory: basics, operations (intersection, union, set difference, symmetric difference), laws involving operations, Venn diagrams, empty set, subsets, $0 \in \mathbb{N} \subseteq \mathbb{Z} \subseteq \mathbb{Q} \subseteq \mathbb{R}$, etc.

Chapter 2: Quantificational Logic.

Logic: For all, there exists, there exists a unique, free/bound variables, equivalences involving quantifiers.

Set theory: truth sets, power sets, families of sets, unions and intersections of families, intervals (not in text, but covered in lecture).

Chapter 3: Proofs.

Proof strategies (see back of book for summary). Use these! For example:

If you are proving a statement "For all $x \in A$, $P(x)$", start that part of the proof with "Let $x \in A$."

If you are proving "There exists a unique x such that $P(x)$", have separate existence and uniqueness sections, and make sure that in the existence part you are really proving existence and not uniqueness!

Chapter 4: Relations. We did **not** cover 4.4.9, 4.4.10, 4.4.11, 4.5.6, 4.5.7, 4.5.8.

Ordered pairs, Cartesian products, relations, domain, range, inverse, composite. Reflexive, symmetric, transitive, anti-symmetric, partial order, total order, smallest, minimal, largest, maximal. Equivalence relations, equivalence class $[x]_R$, set of equivalences classes A/R, congruence mod m.

Chapter 5: Functions. Just 5.1, 5.2 and 5.3.

Functions, composition, range, one-to-one, onto, proof methods, inverses, theorems relating these concepts (e.g. 5.2.5, 5.3.4, 5.3.5).

Chapter 6: Mathematical Induction. Just 6.1, 6.3, 6.4.

Mathematical induction, proof style, $0 \in \mathbb{N}$, recursion, strong induction, existence of prime factorization, well-ordering principle.

Chapter 7: Number Theory. Just 7.1, 7.2, 7.3. We did **not** cover the extended Euclidean algorithm (in 7.1), least common multiples (lcm) (end of 7.2), or solving congruences (end of 7.3).

Divisors, common divisors, greatest common divisor, Euclidean algorithm, Thm 7.1.4.

Relatively prime numbers, uniqueness of prime factorization, fundamental theorem of arithmetic (and the theorems used to prove that), divisors and gcd in terms of prime factorization.

Modular arithmetic, operations mod m, inverses mod m and relationship to being relatively prime.