

Midterm Information

Location: **LINC 100**

Time: **7:00-8:20pm**

Date: **February 7th (2/7)**

What to Bring: **Pencil/Eraser, both sides of a 3x5 inch notecard**

What Not to Bring: Calculators, Headphones, Cellphones(need to be turned off and put away)

Below is a list of topics we have covered so far that will be tested on the first midterm. You should read through the list and make sure that you know and understand the definitions for all terms given as well as study and work through examples of methods or exercises.

- Section 1.1: Propositional Logic
 - Proposition Definition
 - Truth Values/Truth Tables
 - Negation, Conjunction, Disjunction, Exclusive Or
 - Conditional Statement, Converse, Contrapositive, Inverse
 - Biconditional Statement
 - Order of Operators
- Section 1.2: Applications of Propositional Logic
 - Translating Between English Sentences and Logical Expressions
 - System Specifications, Consistency
 - Logic Puzzles
 - Logic Circuits, Logic Gates
- Section 1.3: Propositional Equivalences
 - Tautology, Contradiction, Contingency
 - Logical Equivalence
 - De Morgan's Laws
 - Satisfiability, Solutions
- Section 1.4: Predicates and Quantifiers
 - Propositional Function, Predicate
 - Universal Quantifier, Existential Quantifier, Uniqueness Quantifier
 - Domain, Counterexample
 - Logical Equivalence, De Morgan's Laws for Quantifiers
- Section 1.5: Nested Quantifiers
 - Order of Nested Quantifiers
 - Translation
- Section 1.6: Rules of Inference
 - Argument, Premises, Conclusion
 - Validity, Argument Form, Fallacies
 - Rules of Inference
 - Modus Ponens

- Modus Tollens
 - Hypothetical Syllogism
 - Disjunctive Syllogism
 - Addition
 - Simplification
 - Conjunction
 - Resolution
- Rules of Inference for Quantified Statements
 - Universal Instantiation
 - Universal Generalization
 - Existential Instantiation
 - Existential Generalization
- Section 1.7: Introduction to Proofs
 - Theorem, Proposition, Lemma, Corollary, Conjecture
 - Even and Odd Integers, Rational Numbers, Complex Numbers, Perfect Squares
 - Direct Proof ($p \rightarrow q$)
 - Indirect Proofs
 - Proof by Contraposition ($\neg q \rightarrow \neg p$)
 - Proof by Contradiction ($\neg p \rightarrow (r \wedge \neg r)$)

How to Study

- Review all materials, in particular homework problems and the quiz. These will be the most similar to the exam. Analyze any errors you made on these assignments, so that you know what you did wrong and how to do it right the next time.
- Work on practice problems with friends/classmates – try choosing a problem (odd numbered problems have solutions in the back), then solve it individually before comparing answers and discussing solutions. Quiz each other on definitions or use flash cards.
- Write a page (or two or three) of notes. Go through the list of exam topics and write out definitions and key terms. Explain how to solve types of problems or list some arguments forms. Compare your notes with the lecture notes and the book to see if you missed anything important.
- Ask your instructor (me) and/or your TA any questions you might have. If neither of us is available, try the math tutors in the MLC or the CLC.

The following page of logical equivalence will be provided for you on the exam. Note that this does not include any logical equivalences involving quantifiers nor rules of inference. **If you use a logical equivalence/rule of inference from the book on your exam that is not listed here, be sure to indicate that it is from the book.**

Useful Equivalences

$p \wedge \mathbf{T} \equiv p$ $p \vee \mathbf{F} \equiv p$	Identity Laws
$p \vee \mathbf{T} \equiv \mathbf{T}$ $p \wedge \mathbf{F} \equiv \mathbf{F}$	Domination Laws
$p \vee p \equiv p$ $p \wedge p \equiv p$	Idempotent Laws
$\neg(\neg p) \equiv p$	Double Negation Laws
$p \vee q \equiv q \vee p$ $p \wedge q \equiv q \wedge p$	Commutative Laws
$(p \vee q) \vee r \equiv p \vee (q \vee r)$ $(p \wedge q) \wedge r \equiv p \wedge (q \wedge r)$	Associative Laws
$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$ $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$	Distributive Laws
$\neg(p \vee q) \equiv \neg p \wedge \neg q$ $\neg(p \wedge q) \equiv \neg p \vee \neg q$	De Morgan's Laws
$p \vee (p \wedge q) \equiv p$ $p \wedge (p \vee q) \equiv p$	Absorption Laws
$p \vee \neg p \equiv \mathbf{T}$ $p \wedge \neg p \equiv \mathbf{F}$	Negation Laws
$p \rightarrow q \equiv \neg p \vee q$ $\neg(p \rightarrow q) \equiv p \wedge \neg q$ (proved in class)	Logical Equivalences Involving Conditionals