

## Math 200: Review for Test 1

Definitions are very important in this course. It is of utmost importance that you are able to clearly articulate the central definitions we have covered. In addition, I hope that you have come to an understanding of what constitutes a "proof". Remember that you must write the proof with the assumption that I know nothing, you are to give a complete argument. If you divide by something, you should mention why it is not zero etc... You should state what you are assuming, give connective phrases to guide your reader (me) along your argument. A collection of calculations without explanation will not earn much credit for one of the "proof" questions on the test.

Be able to state definitions for:

- tautology,
- contradiction,
- conjunction(and),
- disjunction(or),
- negation,
- implication(conditional sentence),
- iff(biconditional sentence),
- contrapositive,
- converse of conditional sentence,
- $\exists$  and  $\forall$  and  $\exists!$  relative to a universe of • discourse  $U$ ,
- even and odd integers,
- $a|b$  relative to  $\mathbb{Z}$ ,
- absolute value of a real number,
- necessary and/or sufficient conditions,
- for sets  $A, B$  how we define  $A \subseteq B$ ,
- $\emptyset$ ,
- for sets  $A, B$  how we define  $A = B$ ,
- sets discussed in Example 2.6,
- the power set  $\mathcal{P}(S)$  of a set  $S$ ,
- set builder notation  $\{blah \mid yadda\}$ ,
- union,
- intersection,
- set difference,
- disjoint sets,
- $\tilde{A}$  relative to universe  $U$ ,

- family of sets,
- unions and intersections over a family of sets,
- Well Ordering Principle (WOP),
- $n!$  for  $n \in \mathbb{N}$ ,
- $f_n$  for  $n \in \mathbb{N}$  the Fibonacci numbers,
- ordered pair,
- Cartesian product,
- relation from  $A$  to  $B$ ,
- domain and range of a relation,
- inverse relation,
- relation on  $A$ ,
- composite relation,
- equivalence relation,
- equivalence class,
- partition.

Be able to:

- give proof by truth tables,
- use De Morgan's Laws to negate propositions,
- prove unique existence,
- give direct proofs,
- biconditional proofs,
- proofs by contraposition,
- proof by contradiction,
- PMI, GPMI, PCI, GPCI,
- combinations of the above proof methods and casewise logic.

Likely test format:

1. [15pts] State a number of definitions carefully.
2. [15pts] A collection of true/false, give counter-example questions.
3. [15pts] A proof.
4. [15pts] Calculation involving simple sets. (will test your understanding of set-concepts)
5. [15pts] Prove a given relation is an equivalence relation and find the corresponding partition
6. [5pts] Give a "useful" denial problem. (here "useful" means you cannot just slap a "not" on the sentence, you must apply DeMorgan's laws etc... as appropriate, only one of you gave un-useful denials on all the homework denial problems, you know who you are)
7. [10pts] Truth table problem. (like proof of Theorem 1.2)
8. [10pts] Takehome proof. (will have about one day to complete)

You can expect some of the problems will test understanding of definitions. Other questions will test your ability to construct proofs. The proofs on the test should not involve terribly deep thinking. It will be mostly about your ability to follow a particular method of proof and apply definitions. (this means something like "prove  $\sqrt{2}$  is irrational" wouldn't be a reasonable in-class test question). The take-home problem might involve something less obvious.