

Review for Exam 2 - Math 100, Spring 2005

February 23, 2005

1 General

Where and when: March 4, usual classroom, usual time - try to get there 5 minutes early

What you need: Pencil or pencils, Student ID. You will not be permitted to use a calculator or have anything else on your desk besides the exam, solution sheet, pencils, and your ID.

Form: Multiple choice, 20 problems

Coverage:

Gemignani: Sections 2.4,2.5,2.6; Chapter 3; Chapter 4

All lectures through February 28

Breakdown: (Approximate)

Translating English to/from propositional logic: 4-5 problems

Syntax of propositional logic (WFF, parentheses, subformula): 3-5 problems

Semantics of prop. logic ("true in a model"; using truth tables for tautologies, verifying rules of inference, etc): 7-8 problems

Basic set problems (Definition of set, equality, subset, union, intersection, difference): 6-7 problems

Note that there is overlap, so these numbers do not add to 20!

2 Typical questions:

- 1) **Question:** Which are subformulas of $(A \Rightarrow (\sim B) \wedge ((\sim B) \vee (\sim C)))$?
- (a) A (b) $(\sim B)$ (c) $(A \Rightarrow (\sim B))$ (d) All of the above
- 2) **Question:** Add parentheses (if necessary!) to make the following into correct WFFs:
- (a) A (b) $\sim B$ (c) $A \Rightarrow \sim B$
- 3) **Question:** Translate the following between English and propositional Logic, assuming $P=I$ am too tall, $Q=I$ eat kittens, $R=I$ fit through the door
- (a) $(Q \Rightarrow P)$ (b) $((P \wedge Q) \Rightarrow (\neg R))$ (c) If I don't eat kittens, and I don't fit through the door, then I am not too tall.
- 4) **Question:** The following formulas are NOT WFFS; in each case, find the problem(s):
- (a) $((A \vee B)(A \wedge B))$ (b) $((A \Rightarrow (\sim B) \wedge ((\sim B) \vee (\sim C)))$ (c) $((A \Rightarrow \sim B) \wedge ((\sim B) \vee (\sim C)))$
- 5) **Question:** If a WFF has N proposition letters, how many rows does the corresponding truth table have?
- 6) **Question:** For the following list of WFFS, which are equivalent to which others? (You might want to make one big truth table containing all of them.) (a) $(A \wedge (B \vee C))$ (b) $(A \wedge (\sim C))$ (c) $((A \wedge B) \vee (A \wedge C))$ (d) $(A \vee (B \wedge C))$ (e) $(\sim (A \Rightarrow C))$
- 7) **Question:** Verify that the following are tautologies (i.e., valid WFFs).
- (a) $(A \Rightarrow ((\sim A) \Rightarrow (B \vee C)))$
 (b) $((\sim (A \vee (\sim B))) \vee ((B \wedge C) \Rightarrow (A \vee (\sim B))))$
- 8) **Question:** Verify that the following is a sound deduction rule:
- $$\frac{\begin{array}{l} \neg A \\ B \Rightarrow C \\ A \vee (\neg C) \end{array}}{\therefore B}$$
- 9) **Question:** For this problem, $A = \{1, 2, 3, 4, 11, 44, 81\}$, $B = \{0, 1, 4, 9, 16\}$, $C = \{n^2 | n \in \mathbb{N}\}$, and $D = \{2n | n \in \mathbb{N}\}$
- (a) $A \cap B = ?$ $A \cup B = ?$ $A - B = ?$
 (b) $A \cap C = ?$
 (c) Describe $C \cap D$ in English.
 (d) Is $\{\{1\}, 2, 3\} \subset A$?
 (e) Is \emptyset a subset of A, B, C , or D ?