CS 81

Assignment 1

Due Monday, 26 January 2009

If you have inordinate problems, let me know and I'll consider moving the due date to Wed.

From the Ben-Ari text, chapter 2 (I have copied some of the questions from the text onto this handout.)

#4., last two equivalences

4. Prove (some of) the logical equivalences in Figure 2.6, especially:

$$A \wedge (B \vee C) \equiv (A \wedge B) \vee (A \wedge C),$$
$$A \vee B \equiv \neg(\neg A \wedge \neg B),$$
$$A \wedge B \equiv \neg(\neg A \vee \neg B),$$
$$A \rightarrow B \equiv \neg A \vee B,$$
$$A \rightarrow B \equiv \neg(A \wedge \neg B).$$

#7. (Hint: Find a property of the two operators that is preserved by composition.)

7. Prove that $\wedge$ and $\vee$ cannot define negation.

#8.

8. Prove that if U is satisfiable then $U \cup \{B\}$ is not necessarily satisfiable.

#9. Theorems 2.32, 2.33, 2.34, 2.35
(assume $U = \{A_1, \ldots, A_n\}$).

Theorem 2.32 *If U is satisfiable, then so is* $U - \{A_i\}$ *for any* $1 \leq i \leq n$.

Theorem 2.33 *If U is satisfiable and B is valid, then* $U \cup \{B\}$ *is satisfiable.*

Theorem 2.34 *If U is unsatisfiable, then for any formula B,* $U \cup \{B\}$ *is unsatisfiable.*

Theorem 2.35 *If U is unsatisfiable and for some* $1 \leq i \leq n$, A_i *is valid, then* $U - \{A_i\}$ *is unsatisfiable.*

#10. Theorems 2.39, 2.40

Theorem 2.39 *If* $U \models A$ *then* $U \cup \{B\} \models A$ *for any formula B.*

Theorem 2.40 *If* $U \models A$ *and B is valid then* $U - \{B\} \models A$.