

CS81 Assignment 3
Sequent Calculus, Tableaux, and Predicate Calculus
Due Wednesday, 9 February 2011

Prove the statements below using the sequent calculus, or give a counterexample if the statement is not provable.

1. $(P \rightarrow Q) \wedge (Q \rightarrow R), \neg R \mid - \neg P$
2. $\mid - (P \rightarrow Q) \vee ((Q \rightarrow R) \wedge (R \rightarrow S))$

Using the tableau or block tableau method, determine whether or not the statements below are valid. For any that are not, derive *from the tableau* a valuation that falsifies the statement.

3. $\mid - (R \rightarrow S) \rightarrow ((P \rightarrow R) \rightarrow (P \rightarrow S))$
4. $(P \rightarrow Q), (R \rightarrow S) \mid - (P \vee R) \rightarrow (Q \wedge S)$

For the following statement, give a proof in the form of a block tableau and demonstrate the correspondence with the sequent calculus proof in problem 1.

5. $(P \rightarrow Q) \wedge (Q \rightarrow R), \neg R \mid - \neg P$

Give natural deduction proofs for the sequents below. For number 6, restate the proof using English.

6. $\exists x \neg R(x) \mid - \neg \forall y R(y)$
7. $\exists x (A(x) \rightarrow B(x)) \mid - (\forall x A(x)) \rightarrow (\exists x B(x))$
8. $\neg \forall x \neg R(x) \mid - \exists y R(y)$