

Math 387 Assignment 3

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February 2, 2004

1. Convert the expression $\neg P \rightarrow Q \wedge R$ into the language of mod 2 arithmetic, and show calculations which convert it to an expression representing its truth table, as in the example in the notes.
2. Prove the distributive property of addition over multiplication in boolean algebra ($a + bc = (a + b)(a + c)$) from the other axioms. Hint: de Morgan's law can help.

You can earn additional credit by showing how to eliminate other axioms from the list; many of the axioms are redundant.
3. Prove that $(P \rightarrow Q) \wedge (Q \rightarrow R) \rightarrow (P \rightarrow R)$ is a tautology using sequent calculus.
4. $((P \wedge Q) \rightarrow R) \rightarrow ((P \rightarrow R) \wedge (Q \rightarrow R))$ is not a tautology. Extract the assignments of truth values to this sentence which make it false from a sequent calculus proof tree.
5. Develop sequent calculus rules for the biconditional $P \leftrightarrow Q$ on the left and right.