University of Helsinki
Department of Mathematics and Statistics
Introduction to Logic 1
Course Examination
March 7, 2017

1. Use resolution to derive p_2 from propositional formulas p_0, $(p_0 \to p_1)$, and $(p_0 \to p_1) \to (p_1 \to p_2)$.

2. Use natural deduction to derive $\neg A$ from $\neg(A \wedge B)$ and $A \to B$.

3. Give a semantic proof of

$$(A \wedge C) \to (A \wedge (C \vee B)).$$

4. (a) Explain what is meant by soundness of natural deduction.
   (b) Show that the propositional formula $\neg(A \vee B)$ is not derivable from the propositional formulas $A \to B$ and $\neg(A \wedge B)$.

5. (a) Explain what is meant by saying that a propositional formula is a contingency.
   (b) Is the propositional formula $(p_0 \to p_1) \to (p_1 \to p_2)$ a contingency?

Notes, tables, or calculators are not allowed in the exam.