

L1. Mathematical Logic
Homework Assignment #2.

Exercise 1: Ex. 1, page 52 (Enderton).

Exercise 2: Ex. 3, page 52 (Enderton).

Exercise 3: Ex. 6, page 52 (Enderton).

Exercise 4: Without using the Deduction Theorem and the Completeness Theorem, show that for any propositional formulas ϕ, ψ, χ :

$$\{\phi \rightarrow \psi, \psi \rightarrow \chi\} \vdash_{\mathcal{A}_0} \phi \rightarrow \chi.$$

Exercise 5: By constructing formal proofs, show that for any propositional formulas ϕ, ψ , the following formulas are formal theorems ~~are~~ of $\mathcal{A}_0$:

- (1) $\neg\neg\phi \rightarrow \phi$
- (2) $\neg\phi \rightarrow (\phi \rightarrow \psi)$
- (3) $\phi \rightarrow (\neg\psi \rightarrow \neg(\phi \rightarrow \psi))$.

Exercise 6: (a) Prove that for any set of propos. formulas T :
 T is consistent iff T is satisfiable.

(b) Is the set $\{\neg p_2 \wedge p_3 \rightarrow p_1, p_2 \rightarrow (\neg p_1 \rightarrow p_3), p_1 \leftrightarrow \neg p_3\}$ consistent or not and why?

Deadlines: Solutions should be delivered to the instructor (on paper or by email) by Wednesday, December 3.