Prof. Dr. A. Poetzsch-Heffter
Peter Zeller, M. Sc.

TU Kaiserslautern
Fachbereich Informatik
AG Softwaretechnik

Sheet 3: Logik (SS 2017)

Bearbeitung in der Übung am 27./28. April

Aufgabe 1 Boolsche Funktionen

Prove the following statement:

Let $n \in \mathbb{N}_0$ and $f : \mathbb{B}^n \to \mathbb{B}$ a Boolean function. Moreover let $p_1, \ldots, p_n$ be distinct variables. Then there is a propositional formula $A \in F$, so that for every variable assignment ψ: $f(\psi(p_1), \ldots, \psi(p_n)) = \mathcal{B}_\psi(A)$.

Aufgabe 2 Vollständige Operatormengen

Use structural induction to prove that $\{\neg, \to\}$ is a functionally complete set of operators.

For the proof you may assume that $\{\neg, \wedge\}$ is already proven to be a functionally complete set of operators.

Aufgabe 3 Strukturelle Induktion

Let F' be a set of formulas inductively defined as follows:

1. Variables and negated variables are contained: For all $i \in \mathbb{N}$: $p_i \in F'$ and $(\neg p_i) \in F'$.
2. If $A \in F'$ and $B \in F'$ then also $(A \wedge B) \in F'$.

Prove that there is a formula $A \in F$, for which there is no logical equivalent formula $A' \in F'$.