



J. Hoenicke  
J. Christ

22.01.2013

Hand in solutions via email to  
`christj@informatik.uni-freiburg.de`  
until 29.01.2013 (only Java sources and  
PDFs accepted).

Paper submissions possible after the lecture.

## Tutorials for “Formal methods for Java” Exercise sheet 11

### Exercise 1: Soundness of all-left

Prove soundness of the rule `all-left`. Assume  $\Gamma, \forall X. \phi(X), \phi(t) \implies \Delta$  is a tautology and show that  $\Gamma, \forall X. \phi(X) \implies \Delta$  holds in an arbitrary structure  $\mathcal{M}$ .

### Exercise 2: Hintikka Set

Show that  $H$  as depicted on Slide 8 from Lecture 22 is a Hintikka set. Restrict yourself to the rules for  $\phi \wedge \psi$ ,  $\neg(\phi \wedge \psi)$ ,  $\forall X. \phi(X)$  and  $\neg(\forall X. \phi(X))$ .

*Hint:* First show that if  $\neg\phi \in H$ , then  $\phi \in \Delta$ .

### Exercise 3: Models for Hintikka Sets

Prove the induction step from Slide 11 of Lecture 22 for the formulas  $\phi \rightarrow \psi$ , and  $\forall X. \phi(X)$ .