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Exercises to the lecture Logics  
Sheet 3

Jun.-Prof. Dr. Roland Meyer

Due 29.5.2012 12:00 Uhr

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**Exercise 3.1** [Complete open branches in tableaux]

Prove Lemma 2.10 on the slides using structural induction.

**Exercise 3.2** [Gentzen Calculus]

Prove:

- a)  $(\neg(p \rightarrow q)) \vdash_G (q \rightarrow p)$
- b)  $\vdash_G (p \wedge q) \rightarrow (p \vee r)$
- c)  $s \wedge r, r \rightarrow \neg(p \wedge q) \vdash_G \neg p, \neg q$

**Exercise 3.3** [Tableaux consequence]

Prove:

- a)  $(A \wedge \neg B) \vdash_\tau \neg((\neg A) \wedge (\neg B))$
- b)  $(A \wedge (A \rightarrow B)) \vdash_\tau B$
- c)  $A \rightarrow (B \rightarrow C) \vdash_\tau (A \rightarrow B) \rightarrow (A \rightarrow C)$

**Exercise 3.4** [Davis-Putnam]

Prove using the Davis-Putnam-Method:

- a)  $p \wedge q, q \rightarrow r \models r$
- b)  $p \rightarrow r, q \rightarrow s, p \vee q \models r \vee s$
- c)  $\neg q, p \rightarrow q \models \neg p$
- d)  $\models \neg(p \rightarrow q) \rightarrow (q \rightarrow p)$

**Delivery:** until 29.5.2012 12:00 Uhr into the box next to room 34/401.4