

Notes:

- Please solve these exercises in **groups of two!**
- The solutions must be dropped into the box right next to Prof. Giesl's office until Wednesday, July 20th, 2011, at 11:45 am.
- Please write the **names** and **immatriculation numbers** of all (two) students on your solution. Please staple the individual sheets!
- This whole exercise sheet is **only** relevant for students attending the **V4 (Diplom Informatik and Diplom Mathematik)** version of the lecture. For all other students, the exercises on this sheet do not contribute to the overall number of points that will be required for the exam qualification.
- Since the lectures corresponding to the topics of this exercise sheet were not held in English, this exercise sheet is made available in German. Please send a mail to tes11@i2.informatik.rwth-aachen.de if you require an English version of this exercise sheet and attend the V4 version of the lecture. As usual, you can choose if you wish to hand in your solutions in English or in German.

Exercise 1 (Konfluenz):
(1,5 + 1,5 + 1,5 + 1,5 + 1,5 + 2,5 = 10 points)

Berechnen Sie für die folgenden Termersetzungssysteme die kritischen Paare und überprüfen Sie, welche davon zusammenführbar sind. Welche der Termersetzungssysteme sind lokal konfluent, welche sind konfluent? Welches Kriterium haben Sie jeweils zum Nachweis der Konfluenz genutzt?

a) $\mathcal{R}_1 = \{ f(f(x)) \rightarrow g(x) \}$

b) $\mathcal{R}_2 = \left\{ \begin{array}{l} f(x, f(y, z)) \rightarrow f(f(x, y), z) \\ f(e, x) \rightarrow x \end{array} \right\}$

c) $\mathcal{R}_3 = \left\{ \begin{array}{l} f(x, f(y, z)) \rightarrow f(f(x, y), z) \\ f(x, e) \rightarrow x \end{array} \right\}$

d) $\mathcal{R}_4 = \left\{ \begin{array}{l} \text{gt}(x, s^i(x)) \rightarrow \text{false} \quad | i \in \mathbb{N} \\ \text{gt}(s^i(x), x) \rightarrow \text{true} \quad | i \in \mathbb{N}, i > 0 \end{array} \right\}$

e) $\mathcal{R}_5 = \left\{ \begin{array}{l} \text{minus}(x, 0) \rightarrow x \\ \text{minus}(s(x), s(y)) \rightarrow \text{minus}(x, y) \\ \text{div}(0, y) \rightarrow 0 \\ \text{div}(s(x), y) \rightarrow s(\text{div}(\text{minus}(s(x), y), y)) \end{array} \right\}$

f) $\mathcal{R}_6 = \mathcal{R}_4 \cup \mathcal{R}_5$