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LEHR- UND FORSCHUNGSGEBIET INFORMATIK II
RWTH Aachen · D-52056 Aachen · GERMANY
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Exercises *Functional Programming* – Sheet 10

Solutions will be collected until Friday, July 27, 2001.

Exercise 1 (1 point)

Show that the mgu (most general unifier) is unique up to variable renaming.

Exercise 2 (4 points)

Use the algorithm $\mathcal{W}$ to check the type correctness of the following terms and give the most general type of these terms if possible:

(a) $\lambda x.x$

(b) $\texttt{bot}\,\texttt{bot}$

(c) $x\,x$

(d) $\lambda x.x\,x$

(e) $\texttt{fix}\,(\lambda\,\texttt{fi}\,x.\,x\,(\texttt{fi}\,x))$

Exercise 3 (1 point)

Decide whether the following HASKELL-expression is type correct and explain how the type inference algorithm would handle this expression.

```
case (\x -> x) of f -> plus (f True) (f 3)
```

Exercise 4

Determine the type of the following HASKELL-expression (using the translation into lambda calculus and algorithm $\mathcal{W}$):

```
fact x = if x <= 0 then 1 else (times (fact (x - 1)) x)
```

Exercise 5 (3 points)

Consider following HASKELL-declarations:

```
hdd x = hd (hd x)

hd (Cons x xs) = x
```

(a) Determine the type of `hdd` (using the translation into lambda calculus and algorithm $\mathcal{W}$).

(b) What happens in this example if we use the rule (2) instead of (2a) and (2b) in the transformation to simple HASKELL?