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**Theory I, Sheet 10**

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**Submission: hand in by 27th July 2011 before 16:00**

- The solutions should be submitted in English.
- You must work on your own and write down your own solution. This does not exclude occasional discussions with your fellow students, but solutions copied from other students will not be accepted.

**Exercise 10.1 - Reductions**

[Points: 5]

Let  $f$  be a binary function symbol, and

$$\mathcal{E} = \{f(x, f(y, z)) = f(f(x, y), z), f(f(x, y), x) = x\}$$

Show that  $f(x, x) \xrightarrow{*}_{\mathcal{E}} x$ . For every reduction step, give the identity, the term position, and the substitution (according to the definition of  $\rightarrow_{\mathcal{E}}$ ) you have used.

**Exercise 10.2 - Unify Algorithm**

[Points: 5]

Apply the Unify Algorithm to the following unification problems. Specify every transformation step.

- $\{f(x, y) =? f(h(a), x)\}$
- $\{f(x, y) =? f(h(x), x)\}$
- $\{f(x, b) =? f(h(y), z)\}$
- $\{f(x, x) =? f(h(y), y)\}$