

COSC 6113 3.0—Fall 2002

Posted: Sep 28, 2002

Due: End of October [Exact date TBA]

Problem Set No. 1

- (1) Express each of the functions $\max(x, y)$ and $\min(x, y)$ by *substitution* using only the functions $x + y$ and $x - y$.
- (2) Find in closed form the pairing function $\lambda xy.J(x, y)$ (and its projections $\lambda z.K(z)$, $\lambda z.L(z)$) that enumerates pairs (x, y) by increasing $\max(x, y)$, and in each group with $\max(x, y) = a$ it enumerates in the order

$$(0, a), (1, a), \dots, (a - 1, a), (a, a), (a, 0), (a, 1), \dots, (a, a - 1)$$

- (3) Write a very complete proof of #25 on p.82. You may of course consult the reference.
- (4) Do #32, #33, p.82.
- (5) Do #36, #37, p.82. For #36 let me first remove an ambiguity: Clause (c) on p.82 must be “ $\langle 0, n, m, 2 \rangle \in \widetilde{\mathcal{F}}$ iff $1 \leq m \leq n$ (it stands for $U1^n; 1^m$)”.
Hint. You may want to peek into the web notes (Normal Form Theorems) to get a feel for how “coding-decoding” is handled in the context of the inductive definition of function sets.