EECS 4111/5111 —Fall 2018

Posted: Sep 18, 2018
Due: October 18, 2018.

Problem Set No. 1

NB. *All problems are equally weighted and will be assigned a letter grade; an overall letter grade for the paper will be computed using York's 0–9 GPA scale.*

The problem set list for *grad students* enrolled in EECS 5111 is the entire list here. Undergrads *should omit any problems marked "Grad".*

This is not a course on *formal* recursion theory. Your proofs should be *informal* (but NOT sloppy), *completely argued*, correct, and informative (and if possible **short**). However, please do not trade length for correctness or readability.

All problems are from the "Theory of Computation Text", or are improvisations that I completely articulate here.

(1) Prove that $\mathscr{PR}$ is closed under $(\mu y)_{\leq z}$.

(2) Prove that $\lambda xy.\max(x,y)$ and $\lambda xy.\min(x,y)$ are in $\mathscr{PR}$ without using the switch (if-then-else) function or the definition by cases theorem.

(3) Imitate Example 2.1.3.3 (p.118) to provide a simultaneous recursion definition for $\lambda x.\lfloor x/4 \rfloor$.

From Section 2.12.

(4) Do problems 6, 15

Requirements: In the last problem (15) please consider *only* the special case $k = 4$. *Full marks ("A^+") will go to programs that do not nest the Loop-end instruction!* A correct program that so nests will max at a grade of "B". Of course, correctness must be argued for the general input x for full marks.

(5) Do problems 18, 19

(6) Do problems 29, 35.