# Homework # 4
# due March 18, 13:00

As with all homeworks, please turn in the written part (§3) of your homework at lecture and send the SASyLF proofs (§2) in `sound.slf` by email to `scmalte@inf.ethz.ch` before 1 pm.

## 1 Reading

Please read Chapter 8 in your textbook. We are skipping Chapter 6 since deBruijn indices are not needed in SASyLF (unlike Coq). We are skipping Chapter 7 and all ML implementation chapters.

Please do the following problems from the book:

8.3.5, 8.3.6 (page 98)

Do *not* turn in answers; check against back of book.

## 2 Proofs

Prove the following statements in SASyLF: 8.3.1–3. Put the proofs in `sound.slf` with your name in a comment at the top. The canonical forms lemma (8.3.1) requires a new judgment:

```
judgment canonical: t value : T

----------------- canonical-true
true value : Bool

------------------ canonical-false
false value : Bool

t numvalue
------------- canonical-num
t value : Nat
```

Use this lemma by doing inversion or case analysis on the result it gives.

## 3 Discussion

The rule E-PredSucc has a condition above the line. What happens if we remove this condition? Can we still prove progress and preservation? Explain!

The rule T-Pred has a condition above the line. What happens if we remove this condition? Can we still prove progress and preservation? Explain!

(You might find it helpful to try out what happens using the SASyLF proofs of program and preservation.)

## 4 Literature Survey

Find three papers in the literature that prove progress and preservation (or "subject reduction"). If possible, please reuse papers from you Homework #2. What sort of errors are excluded by each system? Give the URL and the list of errors that are avoided. (Later assignments will continue to build on your choices.)