

# Homework # 1

## due September 13

### 1 Reading

Please read Chapters 1–2 in your textbook.

### 2 Problems

Please do the following problem from the book:

2.2.7 (transitive closure) full natural language proof required

### 3 Pattern Matching

Suppose we have the following definition of natural numbers:

$$n ::= z \mid s n$$

And further, the following definition of addition:

$$\frac{\text{PLUSZERO}}{z + n = n} \qquad \frac{\text{PLUSUCC} \quad n_1 + n_2 = n_3}{s n_1 + n_2 = s n_3}$$

For each of the following possibilities, give the cases that are possible inverting this relation just *once*.

1.  $A + B = C$ .
2.  $s z + B = C$ .
3.  $A + z = C$ .
4.  $A + A = C$ .
5.  $A + B = z$ .

### 4 Graduate Student Assignment

Find names of three “proof assistants” used by computer scientists to mechanize proofs. Explain each in a few sentences. Give a URL of a published proof using each system. (Do not mention SaSYLF.)

### 5 Submission

Turn this homework in on paper at the start of lecture.