

COMP 280 : Assignment 3

due: Thursday, February 10, 2000

1. (3 pts) Section 10.3, Exercise 14 (page 545).
2. (5 pts) Consider the list and number models discussed in class.

$\mathbb{N}$ is the following inductively defined set:

- 0 is in $\mathbb{N}$
- if x is in $\mathbb{N}$, then $\text{succ}(x)$ is in $\mathbb{N}$

Operations:

- $\text{zero?} : \mathbb{N} \rightarrow \text{boolean}$
- $\text{succ} : \mathbb{N} \rightarrow \mathbb{N}$
- $\text{pred} : \mathbb{N} \rightarrow \mathbb{N}$

Axioms:

- $\text{zero?}(0) = \text{true}$
- $\text{zero?}(\text{succ}(x)) = \text{false}$
- if $\text{succ}(x) = \text{succ}(y)$ then $x = y$
- $\text{pred}(0) = 0$
- $\text{pred}(\text{succ}(x)) = x$

$\text{list}[\alpha]$ is the following inductively defined set:

- emptyList is in $\text{list}[\alpha]$
- if a is in α and L is in $\text{list}[\alpha]$, then $\text{cons}(a,L)$ is in $\text{list}[\alpha]$

Operations:

- $\text{EmptyL?} : \text{list}[\alpha] \rightarrow \text{boolean}$
- $\text{cons} : \alpha \times \text{list}[\alpha] \rightarrow \text{list}[\alpha]$
- $\text{head} : \text{list}[\alpha] \rightarrow \alpha$
- $\text{tail} : \text{list}[\alpha] \rightarrow \text{list}[\alpha]$
- $\text{newlist} : \rightarrow \text{emptyList}$

Axioms:

- $\text{EmptyL?}(\text{emptyList}) = \text{true}$
- $\text{EmptyL?}(\text{cons}(a,L)) = \text{false}$
- $\text{head}(\text{cons}(a,L)) = a$
- $\text{tail}(\text{cons}(a,L)) = L$

Prove that the list model captures the number model.

3. (2 pts) Section 6.2, Exercise 6 (page 328)
4. (2 pts) Section 6.2, Exercise 7b (page 328)

5. (2 pts) Section 6.2, Exercise 7f (page 328)
6. (2 pts) Section 6.2, Exercise 8b (page 328)
7. (2 pts) Section 6.2, Exercise 10f (page 328)