CS486 Applied Logic Final Assignment Due Thurs, May 3, 2001

Reading: Please read Stewart & Tall, p. 172-182, Chapter 13.

Exercises:

1. Write a careful proof of the stamps theorem from lecture, showing explicit use of these rules: induction on integers, recursive definition (reduce), $\vee$L, $\vee$R, $\forall$L, $\forall$R, arith, and equality.

   The equality rules include those for *hd*, *tl* and *cons* such as
   $hd(a.t)=a$, $tl(a.t)=t$ and $l \neq [\ ] \Rightarrow (hd(l).tl(l)=l)$.

2. Write a program to compute the function specified by stamps.

3. Sketch a proof of this conjecture:

   Define x is_on l = if $x=[\,]$ then 0;
   else if $x=hd(l)$ then 1;
   else x is_on $tl(l)$.

   Show $\forall l{:}\text{list}.\ \ \forall i{:}\text{int}.\ (1 \leq i \leq \text{length}(l) \Rightarrow (\text{index}(i,l)$ is_on $l)=1$

4. Discuss the issue of how logic can help in specifying programming tasks and how careful proof helps prevent errors in program design.

‘