Programming Languages (COP 4020/6021) [Spring 2016]

Assignment III

Objectives
1. To gain experience writing inference rules in deductive systems.
2. To practice proving properties of judgments by induction on their derivations.

Due Date: Monday, February 8, 2016 (at the beginning of class, 5:00pm).

Assignment Description
Do the following by yourself.
I. Define inference rules for greater-than and less-than judgments over natural numbers. The *judgment forms* are: $N_1 > N_2$ and $N_1 < N_2$. Recall that N_1 and N_2, being natural numbers, adhere to our definition of natural numbers (N nat), as discussed in class. Your definitions of valid greater- and less-than judgments must match the normal mathematical notions of natural numbers being greater, or less, than others (e.g., $31 > 21$).

II. Using your definitions of greater-than and less-than, prove that for all natural numbers N_1 and N_2: $(N_1 > N_2)$ if and only if $(N_2 < N_1)$.

III. Prove that your less-than operator is *transitive*, i.e., for all natural numbers N_1, N_2, and N_3: if $N_1 < N_2$ and $N_2 < N_3$ then $N_1 < N_3$.

Grading Notes
Partial credit is always possible. If you get stuck, just explain informally whatever ideas you're having trouble stating formally.

Submission Notes
- Write the following pledge at the end of your submission: "I pledge my Honor that I have not cheated, and will not cheat, on this assignment." Sign your name after the pledge. Not including this pledge will lower your grade 50%.
- For full credit, turn in a hardcopy (handwritten or printed) version of your solutions.
- You may submit solutions up to 2 days late (i.e., by 5pm on Wednesday, February 10) with a 15% penalty. Late submissions may be emailed or submitted in hardcopy.
- All emailed submissions, even if sent before the deadline, will be graded as if they were submitted late, i.e., with a 15% penalty.
- If you think there's a chance you'll be absent or late for class on the date this assignment is due, you're welcome to submit solutions early by giving them to me or a TA before or after class, or during any of our office hours.