

**Homework Assignment 11 NOTE: due Friday April 17  
at 5:00 (I have a thesis defence to attend at 1, and I  
want to be available for my usual pre-handing in  
consultation.)**

1. Chapter 8, Exercise 1
2. Say that  $R$  is an irreflexive, transitive two-place relation on a domain  $D$ , and that for every  $d \in D$  there is some  $e \in D$  such that  $R(e, d)$ . Can there be such a relation if  $D$  is finite? If so, give an example, and if not, explain why not. Give an example of an irreflexive, transitive relation on an infinite domain.
3. Chapter 8, Exercise 12
4. Chapter 8, Exercise 13
5. Chapter 8, Exercise 17
6. Produce a fifth static tictactoe language: this one will have coordinates  $\{1, 2, 3\}$  for the columns, and  $\{1, 2, 3\}$  for the rows. (To describe the location of an X or an O you will need two variable places: one for the column coordinate, and one for the row coordinate.). In this language, give expressions that are true of all and only the situations in which a) There are three X's in a line b) There are three O's in a line. To see the increase in simplicity, write down the expressions for a) and b) in the first static tictactoe language from the earlier chapters.