Fall 2003 CSC2423 Finite model theory and descriptive complexity

Assignment 2

Exercises (due date: December 3).

As described in class.

Problems and Challenges. (due date: late December). Choose one or two you want to work on. It's ok to work in groups. It's better to have a complete solution for one problem rather than make progress towards solving two.

(1) Prove that graph connectivity is not definable in $\exists$MSO, even over ordered graphs.

(2) Prove that the arity hierarchy of SO is strict: for each n, there is a SO-definable property which is not definable with quantification over relations of arity at most n.

(3) Provide logical characterization of EXPTIME (or NEXPTIME, choose one).

(4) Same for the class of problems of elementary data complexity.

(5) Prove that for each $k > 2$, there is a property of ordered structures definable in FO^{k+1} but not in FO^k.

(6) If (5) seems hard, try $k = 2$.