

CS 476 Homework #6 Due 10:45am on 10/3

Note: Answers to the exercises listed below in *typewritten form* (latex formatting preferred) as well as code solutions should be emailed by the above deadline to `clarage2@illinois.edu`.

1. Except for now not having to be enclosed in parentheses, the module below is exactly the same used in Homework 5, namely, lists with a list append function that is associative and has `nil` as an identity element, but where the associativity and identity axioms are explicitly defined by equations:

```
fmod LIST-EXAMPLE is
  sorts Element NeList List .
  subsorts Element < NeList < List .
  op a : -> Element [ctor] .
  op b : -> Element [ctor] .
  op c : -> Element [ctor] .
  op nil : -> List [ctor] .
  op _;_ : List List -> List .
  op _;_ : Element NeList -> NeList [ctor] .
  eq (L:List ; P:List) ; Q:List = L:List ; (P:List ; Q:List) .
  eq L:List ; nil = L:List .
  eq nil ; L:List = L:List .
endfm
```

In Homework 5 we were lacking the check of a remaining *executability condition*, namely, termination. You are asked to prove that LIST-EXAMPLE is *terminating* using the the MTA tool (follow the link to MTA in the “Readings Material” section of the Course web page). When using the MTA Tool, parentheses should not be used for entering the module in Maude. However, parentheses are used to enclose MTA commands.

You can try to prove LIST-EXAMPLE terminating with MTA using either an RPO order, or a polynomial order: whichever works for you. You can get 50% *extra credit* (i.e., a grade of 15 over 10 for this problem) by proving it terminating in *both* ways, i.e., using an RPO order for one proof, and a polynomial order for an alternative proof.

Note. Since the *metadata* information needed for the termination proofs is *different* for each termination method, the best approach is for you to: (1) write a first version of LIST-EXAMPLE where you have added the *metadata* information for your chosen termination proof method; (2) (for extra credit) if you wish, you can develop another version with different *metadata* information for your alternative proof of termination with an alternative termination proof method.

Email your metadata-annotated module(s) as well as screenshots of your interaction(s) with MTA to: `clarage2@illinois.edu`.

2. Solve **Ex.11.6** in page 20 of Lecture 11.