MCS 380/590 Intro To Artificial Intelligence
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*P*rogramming Assignment #1: Syntax –**UPDATED**
ANSI Common Lisp (Graham)

DUE DATE: THURSDAY, OCTOBER 05

2.2 Give three distinct `cons` expressions that return `(a b c)`

2.7 Define a function that takes a list as an argument and returns `T` if one of its elements is a list. Use any of the following to express your answer (`list, car, cdr, cons, third, listp, not, if, and, or, third, format, let, boundp, apply, funcall, null, lambda, quote`).

3.2 Write a version of union that preserves the order of the elements in the original lists:
```
-- (new-union '(a b c) '(b a d))
(A B C D)
```

3.4 Why does the following expression return `nil`?
```
-- (member '(a) '((a) (b)))
NIL
```

3.5 Suppose the function `pos+` takes a list and returns a list of each element plus its position:
```
-- (pos+ '(7 5 1 4))
(7 6 3 7)
```

Define this function using:

a. recursion

b. iteration

c. `mapcar`

4.3 Define a structure to represent a tree where each node contains some data and has up to three children. Define the following:

a. function to copy such a tree (so that no node in the copy is `eql` to a node in the original.

b. function that takes an object and such a tree, and returns `T` if the object is `eql` to the data field of one of the nodes.

5.7 Define a function that takes a list of numbers and returns `T` iff the difference between each successive pair of them is 1, using:

a. recursion

b. do

c. `mapc` and `return`

6.3 Define a function that takes any number of arguments and returns the number of arguments passed to it.

8.1 Is it possible for two symbols to have the same name but not be `eql`?

x.x Write a function to compute the binomial coefficients c(n,r) using the recursive formulas:

$C(n, 0) = 1$
$C(n, n) = 1$
$C(n, k) = C(n - 1, k - 1) + C(n - 1, k)$

3.9 **Extra Credit** Write a program to find the longest finite path through a network represent as in Section 3.15. The network may contain cycles.