CS3723 Pgm2 Lisp Spring 2020 (20 points)- due 2020-03-30

© 2020 Larry W. Clark, this document may not be copied to any other website.

Code the functions listed below and use the specified test cases. If you cheat on this assignment, you will most likely do poorly with the LISP coding on the final exam.

Notes:

* Look at the set up information for more information on executing LISP files.
* The **only** functions you can use are either those we discussed in the LISP notes (including ones we developed as exercises) or you can reuse any of the functions developed below in subsequent functions.
* Place your code in p2Lisp.txt. Use (load "p2Lisp.txt" :echo T :print T) to load your source code.
* Your functions must be executed on a **fox** server using the specified test cases. Use (load "p2LispRun.txt" :echo T :print T).
* Turn in a zip file named LastNameFirstName.zip (no spaces) containing:
  + Your source LISP code (p2Lisp.txt)
  + Your log o﻿f the session. Select all the text in the terminal window and paste it into a file named p2Out.txt
  + Do **not** have any directories within your zip file.
* In BlackBoard, include a note that specifies whether you did the extra credit.
* Your code must follow my **LISP programming standards**.

1. Code the function (**insertNth** *list N* *insValue*) which constructs a new list by inserting the specified *insValue* into the list after the Nth top-level value (relative to 1).

Example:

> (insertNth '(X Y Z) 2 'FUN)

(X Y FUN Z)

> (insertNth '(X Y Z) 4 'FUN)

(X Y Z)

2. Code the function, **reverseTop**, which is passed a list and returns a reversed list of the high-level entries.

Hint: APPEND could be useful.

Examples:

> (reverseTop '(X Y Z))

(Z Y X)

> (reverseTop '(X (Y Z (A)) (W)))

((W) (Y Z (A)) X)

3. Code the function, **reverseAll**, which is passed a list and returns a reversed list at all levels.

Examples:

> (reverseAll '(X Y Z))

(Z Y X)

> (reverseAll '(X (Y Z (A)) (W)))

((W) ((A) Z Y) X)

4. Code the function, **removeNILTop**, which is passed a list and removes NIL at the top level.

Examples:

> (removeNILTop '(NIL X NIL NIL Y NIL Z))

(X Y Z)

> (removeNILTop '(X NIL Y NIL Z NIL))

(X Y Z)

> (removeNILTop '(NIL (X NIL Y) (NIL NIL)))

((X NIL Y) (NIL NIL))

Note: some of you might find this function useful in Pgm#3.

5. Code the function, **removeNILMost**, which is passed a list and removes NIL at any level. Note: if the result of removing NIL gives a NIL, it is unnecessary to remove that resulting NIL. (See the extra credit.)

Examples:

> (removeNILMost '(NIL X NIL NIL Y NIL Z))

(X Y Z)

> (removeNILMost '(X NIL (Y NIL Z) NIL))

(X (Y Z))

> (removeNILMost '(NIL (NIL) (X NIL Y) (NIL NIL) Z))

(NIL (X Y) NIL Z)

> (removeNILMost '(NIL ( (((((NIL) NIL)))))))

((((((NIL))))))

6. Code the function, **palindrome**, which is passed a list and returns T if the list is a palindrome; otherwise, it returns NIL. It only needs to be a palindrome at the top-level.

Examples:

> (palindrome '(R A C E C A R))

T

> (palindrome '(W A S I T A C A R O R A C A T I S A W))

T

> (palindrome '(N I X O N))

NIL

**7.** Code the function, (**evalEach** *lis*) which evaluates each item in the *lis* using the built-in EVAL function. Its functional value is the value of the last expression evaluated.

> (evalEach '( (setf A 5) (print 'hello) (print 'there) A))

HELLO

THERE

5

> (evalEach '( (setf x 10 ) (setf A '(x y z)) (print A) (setf B (car A)) (set B (+ 5 x)) ))

(X Y Z)

15

> (print B)

X

X

> (print X)

15

15

Note: some of you might find this function useful in the Extra Credit Lisp Pgm.

**Extra credit**: (2 pts + 150 / n where n is the number of people that get it completely right)

Code the function **removeNILAll** which also removes any resulting NIL (except the single outermost)

> (removeNILAll '(NIL (NIL) (X NIL Y) (NIL NIL) Z))

((X Y) Z)

> (removeNILAll '(NIL ( (((((NIL) NIL)))))))

NIL

To receive extra credit:

* **removeNILAll** must work for all possible cases.
* The other functions must work for all possible cases.
* **All your functions** must be properly **documented**.
* Your submission **MUST NOT be late.**