CSCI 325
Spring 2013
Bowring

HW 9 – DUE 10 AM 1.Mar.2013

Instructions:
Submit **HW9_[lastname].lisp** by dropping it into your Assignments folder on Google Drive.
Please document your code.

1. Define a function our-member that accepts two arguments, the second of which is a list. our-member returns T is the first argument is a top-level member of the second and returns NIL otherwise.
   (our-member 'a nil) --> nil
   (our-member 'a '(c a b)) --> T
   (our-member 'a '(c (a) b)) --> nil
   (our-member '(a) '(c (a) b)) --> T

2. Define a function presentp that accepts two arguments, the second of which is a list. presentp returns T is the first argument appears anywhere in the second and returns NIL otherwise.
   (presentp 'a nil) --> nil
   (presentp 'a '(c a b)) --> T
   (presentp 'a '(c (a) b)) --> T
   (presentp '(a) '(c a b)) --> NIL
   (presentp '(a) '(c ((a)) b)) --> T

3. A set can be represented in LISP as a list, with each element of the set being represented by an atom. Define the following set operations:
4.

our-union	accepts two arguments which are sets and returns their union
our-intersetcion	accepts two arguments which are sets and returns their intersection
our-set-difference	accepts two arguments which are sets and returns the elements of the first with the elements of the second removed
samesetp	tests whether two sets contain the same elements (note, the elements in each set need not appear in the same order)

5. A mobile is a form of abstract art containing objects suspended in the air by fine wires hanging from horizontal beams. If we assume each beam is suspended from its midpoint then we can represent such a mobile as a binary tree. Single suspended objects are represented by numbers equal to their weights, while more complicated mobiles are represented by a three-element list. The first element is a number equal to the weight of the beam and the other two elements represent submobiles attached at the two ends of the beam. A mobile should be balanced, meaning any mobiles suspended from opposite ends of a beam should be equal in weight.

   Define a function mobilep that determines whether a mobile is balanced. It returns NIL if it is not and its total weight if it is.

   (mobilep '(6 (3 (2 1 1) 4) (1 5 (1 2 2))))) --> 28