Assignment 9
due December 3

1. Write the function `dot-product` of two vectors (i.e., list of numbers) `l1` and l2 that multiplies corresponding numbers in `l1` and `l2` and builds a new *number* by summing the results. The vectors are of the same length.

   Example: `(dot-product '(1 2 3) '(3 2 4))` returns 19.

2. Write the function `subset` which takes two lists `l1` and `l2` and returns true if `l1` is a subset of `l2`.

   Examples: `(subset '(1 2) '(0 3 2 1))` is true.

   `(subset '(1 2) '(0 3 2 4))` is false.

   `(subset () '(0 3 2 1))` is true.

3. Write the function `insertL` which takes three arguments: the atoms `new` and `old`, and a list of atoms. It builds a list with `new` inserted to the *left* of the first occurrence of `old`.

   Example: `(insertL 'fudge 'fruit '(ice cream with fruit for dessert))` returns `(ice cream with fudge fruit for dessert)`.

4. Write the function `substall` which takes three arguments: the atoms `new` and `old`, and a list of atoms. It builds a list in which *all* occurrences of `old` are replaced by `new`.

   Examples: `(substall 'fudge 'fruit '(ice cream with fruit and more fruit))` returns `(ice cream with fudge and more fudge)`.

5. Write the function `rember2` which takes two arguments: an atom `a` and a list of atoms `l` and removes the second occurrence of `a` in `l`.

   Examples: `(rember2 'fudge '(ice cream with fruit for dessert))` returns `(ice cream with fruit for dessert)`.

   `(rember2 'ice '(ice cream with fruit and ice cream with fudge))` returns `(ice cream with fruit and cream with fudge)`.

   `(rember2 'ice ())` returns `()`.

   Hint: Use the function `rember` that we wrote in class in your function.

6. Write the function `occurN` which takes two lists `l1` and `l2` and counts how many times an atom in `l1` occurs in `l2`.

   Examples: `(occurN '(fudge ice cream) '(ice cream with fruit for dessert))` returns 2.

   `(occurN '(fudge fruit) '(ice cream with fruit for dessert))` returns 1.

   `(occurN '(fudge ice cream) ())` returns 0.

   Hint: Implement this by writing two function.

7. Write the function `pair` which takes two lists `l1` and `l2` of the same length and returns a list of two-element lists containing successive pairs of an element from each.

   Example: `(pair '(a b c ) '(1 2 3))` returns `( (a 1) (b 2) (c 3) )`.

8. Write a function `assoc` that takes an atom `x` and a list `l` of the form created by `pair` (in the previous question) and returns the second element of the first list in `l` whose first element is `x`.

   Example: `(assoc y '((x a) (y b) (z c)))` returns `b`.

Instructions:

Submit your solutions through Blackboard. Your submission must be a file with extension "el", e.g., hw9.el.

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