

York University- Department of Computer Science and Engineering

SC/CSE 3401 3.00 – Functional and Logic Programming

Assignment 4

- 1) This assignment is due on **April 2, 2012 at 3:30pm electronically**
 - 2) Review policy on academic honesty. The submitted assignment must be each individual's own work.
 - 3) NO LATE ASSIGNMENTS!
 - 4) You need to submit this assignment electronically. Include all your code in one single file. Comment your code, separating questions clearly. Please read the submit instructions.
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1) (25 marks) Cash Register Problem

Write a function calcTotal that calculates the total balance of a shopping cart. Here is an example:

```
> (calcTotal '(shirtA 3 shirtB 1 shoes101 3 shirtA 1)
      '(shoes101 75 shirtA 25 shirtB 55) 0.13)
The total before tax is 380.00
The total tax is      49.40
The total after tax is 429.40
NIL
```

The first argument is the shopping cart. The second argument is the price list. . The third argument (0.13) is the tax rate. Please pay attention to the format of the returned results.

In addition, we want function calcTotal to use zero percent tax rate if it is not supplied, and read the price list from the file pricelist.txt if given nil the second argument. For example:

```
> (calcTotal '(milk 1 bread 2 egg 12 honey 1) nil)
The total before tax is 15.60
The total tax is      0.00
The total after tax is 15.60
NIL
```

2) (15 Marks) Find the pattern

(a) Write a function that can find the pattern in a list of four numbers. Assume the pattern is always a linear function in the form $x_n = \alpha x_{n-2} + \beta x_{n-1}$

Hint: Given four numbers in a list, you need to solve a system of two linear functions to find α and β .

(b) Write a function that can print the next N numbers in a pattern given the function, first two numbers in the pattern, and N.

(c) Using above functions, write the function **guess10** that asks for the four numbers in a list, finds the pattern (assuming above pattern format), and prints 10 numbers using the pattern.

For example:

```
> (guess10)
A list of four numbers please: (1 1 5 13)
```

The pattern function is:

```
(LAMBDA (X1 X2) (+ (* 3 X1) (* 2 X2)))
```

Here are 10 values in this pattern:

```
(1 1 5 13 41 121 365 1093 3281 9841)
```

```
> (guess10)
```

```
A list of four numbers please: (1 1 4 1)
```

The pattern function is:

```
(LAMBDA (X1 X2) (+ (* 5 X1) (* -1 X2)))
```

Here are 10 values in this pattern:

```
(1 1 4 1 19 -14 109 -179 724 -1619)
```

3) (10 marks) Write a function that deletes all odd numbers in a given list. Assume the list contains natural numbers (no checking required).

(a) Use recursion

(b) Use iteration

```
> (DelOddRec '(1 2 3 4 5 6 7 8 9 10 11))
(2 4 6 8 10)
> (DelOddIter '(1 2 3 4 5 6 7 8 9 10 11))
(2 4 6 8 10)
```

4) (5 marks) Write a function that calculates the dot product of two vectors. Assume the vectors are supplied as lists (no checking necessary).

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

5) (5 marks) Write a function that counts the number of words in a text file, given filename. Assume a simple case such as the provided example file. Consider a sequence of characters (letters, numbers, signs, etc) as a word if separated from adjacent sequences by spaces or line feeds (no need to check if they are actually words or not).

For example, in my machine, I can write:

```
> (countwords "c:\\sampleText.txt")
```

```
29
```