DTU Informatics 30/8 2011

Michael R. Hansen

# 02157 Functional Programming: Getting started with lists

The purpose of this exercise is to make you acquainted with some high-level features of F# and to illustrate a solution to a problem, which is based on "declarative" properties of the entities under consideration.

We represent the polynomial $a_0 + a_1 \cdot x + ... + a_n \cdot x^n$ with integer coefficients $a_0, a_1, ..., a_n$ by the list $[a_0, a_1, ..., a_n]$. For instance, the polynomial $x^3 + 2$ is represented by the list $[2, 0, 0, 1]$.

You should solve the following exercises by filling out the program skeleton which is available from the course homepage.

1. Declare an infix F# function `+.` for addition of polynomials in the chosen representation.

2. Declare a F# function `mulC` for multiplying a polynomial by a constant.

3. Declare a F# function `mulX` for multiplying a polynomial $Q(x)$ by $x$.

4. Declare an infix F# function `*.` for multiplication of polynomials in the chosen representation. The following properties are useful when defining the multiplication:

$$\begin{aligned}
&0 \cdot Q(x) = 0 \\
&(a_0 + a_1 \cdot x + ... + a_n \cdot x^n) \cdot Q(x) \\
&\qquad = a_0 \cdot Q(x) + x \cdot ((a_1 + a_2 \cdot x + ... + a_n \cdot x^{n-1}) \cdot Q(x))
\end{aligned}$$

5. Declare a F# function to give a textual representation for a polynomial.
   Hint: You can convert an integer $a$ to a string by the expression `string(`$a$`: int)`.