Advanced Data Structures

Labwork 7: Polynomials

January 2021

This labwork is related to Lecture 12: *Polynomials. Fast multiplication with FFT*, and is intended to verify your understanding of

- data structures for polynomial representation,
- operations on polynomials and their runtime complexity.

Deadline: by the end of the day when you received the labwork.
You should upload images (or text files) with pseudocode for the following requirements:

1. Write down the pseudocode of Inverse-FFT(y) by modifying the pseudocode of Recursive-FFT(a) as suggested in the lecture notes.
2. Suppose $a = (a_0, a_1, \ldots, a_{n-1})$ is the coefficient representation of a polynomial $A(x)$ with degree-bound n, and $B(x) = (x - b)\,A(x)$.
   (a) Write down the pseudocode of Multiply1(a, b) which computes in time $\Theta(n)$ the coefficient representation $(b_0, b_1, \ldots, b_n)$ of polynomial $B(x)$.
   (b) Write down the pseudocode of Quotient1(a, b) which computes in time $\Theta(n)$ the coefficient representation $(b_0, b_1, \ldots, b_{n-2})$ of the quotient of dividing $A(x)$ by $x - b$.
   (c) Write down the pseudocode of Remainder1(a, b) which computes in time $\Theta(n)$ the remainder of dividing $A(x)$ by $x - b$.
      – Remark: the remainder of dividing $A(x)$ by $x - b$ is the value of $A(b)$.