

Design and Analysis of Algorithms 2008

(Home work 4)

October 29, 2008

- Due on Thursday, November 6, before 8 a.m.
- You have a total of 7 late days in the whole term.
- Please give precise arguments for all statements that you write.
- Please do not hesitate to contact me if you do not understand the problems.
- Each problem in this homework bear 10 points.
- Collaboration is encouraged, but you should not copy solutions, but write down your own answers. If copying is detected that may immediately lead to a grade less than 7. (**This would be followed strictly**)
- Credits would be given to partial solutions also.
- The answers should be typed or written clearly and a hard copy is to be submitted.

1. Give a divide and conquer algorithm to multiply two polynomials of degree $n - 1$ which run in time $\Theta(n^{\lg 3})$.
2. The formula for Lagrange interpolation was discussed in class. Show how one can interpolate using Lagrange's formula in $O(n^2)$ time.
3. We discussed in class that following the FFT algorithm an analogous algorithm can be written to find the inverse DFT. Write the pseudo-code to compute inverse DFT in $\Theta(n \lg n)$ time.
4. A Toeplitz matrix is a $n \times n$ matrix $A = [a_{ij}]$ such that $a_{ij} = a_{i-1, j-1}$ for $i = 2, 3, \dots, n$ and $j = 2, 3, \dots, n$. Give an $O(n)$ algorithm to add two Toeplitz matrices.