

22C : 231 Design and Analysis of Algorithms
Homework 1
Due Thursday, September 11

Program the simple $O(n^2)$ algorithm and the recursive $O(n^{\log_2 3})$ algorithm for multiplying two polynomials of degree $n - 1$. All arithmetic should be modulo 7. Thus for instance the addition of polynomials $3x^2 + 5x + 1$ and $5x^2 + 2x + 4$ gives the polynomial $x^2 + 0x + 5$. And the multiplication of the polynomials $2x + 5$ and $4x + 3$ gives $x^2 + 5x + 1$. You will have to generalize the recursive algorithm so that it works for any n , not just powers of 2.

For the input, use random integers in the range $[0, 6]$ as the coefficients of the two polynomials. Check that the two programs give the same result when fed the same input.

Compare the observed running times of the two programs as you increase n , and report your observations. The exact nature of the report is up to you. Don't submit your source code unless you are asked to. I suggest increasing n to about 10^4 or 10^5 , assuming the programs finish in reasonable time for such input sizes. Use your favorite programming language and environment, but mention them in your report.