COMPUTING AURIFEUILLIAN FACTORS

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Abstract

For odd square-free $n > 1$, the cyclotomic polynomial $\Phi_n(x)$ satisfies an identity

$$\Phi_n(x) = C_n(x)^2 \pm nxD_n(x)^2$$

of Aurifeuille, Le Lasseur and Lucas. Here $C_n(x)$ and $D_n(x)$ are monic polynomials with integer coefficients. These coefficients can be computed by simple algorithms which require $O(n^2)$ arithmetic operations over the integers. Also, there are explicit formulas and generating functions for $C_n(x)$ and $D_n(x)$. This paper is a preliminary report which states the results for the case $n = 1 \bmod 4$, and gives some numerical examples. The proofs, generalisations to other square-free n, and similar results for the identities of Gauss and Dirichlet, will appear in [2].

Comments

Only the Abstract is given here. The full paper will appear as [1]. For a more comprehensive (but more difficult) paper, see [2].

References

1. R. P. Brent, "Computing Aurifeuillian factors" *Proceedings of a Conference on Computational Algebra and Number Theory*, held at Sydney University, November 1992 (edited by W. Bosma and A. van der Poorten), to appear. rpb127.
2. R. P. Brent, "On computing factors of cyclotomic polynomials", *Mathematics of Computation* (D. H. Lehmer memorial issue), 1993, to appear. rpb135.

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