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Flat Littlewood Polynomials Exist

A polynomial $P(z) = \sum_{k=0}^n \varepsilon_k z^k$ is a Littlewood polynomial if $\varepsilon_0, \dots, \varepsilon_n \in \{-1, 1\}$. We will describe a proof that, for every $n \geq 2$, there exist 'flat' Littlewood polynomials of degree n , that is, with

$$\delta\sqrt{n} \leq |P(z)| \leq \Delta\sqrt{n}$$

for all $z \in \mathbb{C}$ with $|z| = 1$, for some absolute constants $\Delta > \delta > 0$. This answers a question of Erdos, and confirms a conjecture of Littlewood. The proof is entirely combinatorial, and uses probabilistic ideas from discrepancy theory.

Joint work with Paul Balister, Béla Bollobás, Julian Sahasrabudhe and Marius Tiba.