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Zeros of Optimal Functions in the Cohn-Elkies Sphere Packing Theorem.

Recent breakthroughs by Viazovska et al. have provided solutions to the sphere packing problem in $\mathbb{R}^8$ and $\mathbb{R}^{24}$ by exhibiting an explicit optimal function, arising from the theory of modular forms, for the Cohn-Elkies linear program in those dimensions. These functions have roots exactly at the lengths of elements of the respective optimal lattices: $\{\sqrt{2n}\}_{n\geq 1}$ for the E_8 lattice, and $\{\sqrt{2n}\}_{n\geq 2}$, for the Leech lattice. But what are the roots of optimal functions in other dimensions? We prove that the number of sizes up to X of roots of an optimal function grows at least linearly in X for $n \geq 1$ and that the distances between the sizes of the roots are not bounded from below for $n \geq 2$. (Received September 25, 2018)