COMBINATORICS
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A Double Exponential Bound on Folkman Numbers

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Abstract: For two graphs, G and F, we write $G \longrightarrow F$ if every 2-coloring of the edges of G results in a monochromatic copy of F. A graph G is *k-Folkman* if $G \longrightarrow K_k$ and $G \not\supset K_{k+1}$. We show that there is a constant $c > 0$ such that for every $k \geq 2$ there exists a k-Folkman graph on at most $2^{k^{ck2}}$ vertices. Our probabilistic proof is based on a careful analysis of the growth of constants in a modified proof of the result by Rödl and the speaker from 1995 establishing a threshold for the Ramsey property of a binomial random graph $\mathbf{G}(n, p)$. Thus, at the same time, we provide a new proof of that result (for two colors) which avoids use of the regularity lemma. This is joint work with Vojta Rödl and Mathias Schacht.

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