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Seeking lower bounds to Ramsey numbers using Dirichlet Difference Graphs.

A Ramsey number $n = R(s, t)$ is the smallest integer such that if a graph G has order n , then either G contains a K_s sub-graph or \bar{G} contains a K_t sub-graph. With very few Ramsey numbers known, we seek to improve upon the known lower bounds for certain Ramsey numbers of the form $R(3, t)$ and $R(4, t)$. We do this by examining the properties of Dirichlet Character Difference Graphs. A Dirichlet character $\chi_n(k)$ for a prime p is equal to 1 if and only if k is an n^{th} residue of p . Dirichlet Character Difference Graphs are circulant graphs with the generators $\{k : \chi_n(k) = 1\}$. The maximum clique number of these graphs and their complements can give lower bounds to Ramsey numbers. (Received September 24, 2012)