

For a graph G , the k -colour Ramsey number $R_k(G)$ is the least integer N such that every k -colouring of the edges of the complete graph K_N contains a monochromatic copy of G . Let C_n denote the cycle on n vertices. We show that for fixed $k \geq 3$ and n odd and sufficiently large,

$$R_k(C_n) = 2^{k-1}(n-1) + 1.$$

This generalises a result of Kohayakawa, Simonovits and Skokan and resolves a conjecture of Bondy and Erdős for large n . We also establish a surprising correspondence between extremal k -colourings for this problem and perfect matchings in the hypercube Q_k . This allows us to in fact prove a stability-type generalisation of the above. The proof is analytic in nature, the first step of which is to use the Regularity Lemma to relate this problem in Ramsey theory to one in convex optimisation.

This is joint work with Matthew Jensen.