Small talk on monochromatic cycles

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Abstract

Exercise 1. Color the edges of the complete graph K_{2^r} with r colors so that there is no monochromatic odd cycle.

Exercise 2. In every coloring of the edges of K_{2^r+1} with r colors there is a monochromatic odd cycle.

Let $f(r)$ denote the smallest integer m for which there is a monochromatic *even* cycle in every coloring of the edges of K_m with r colors.

Exercise 3. $f(2) = ?$

Exercise 4. Prove that $f(3) = 10$.

I shall discuss more serious matters too, for example the result of Bessy and Thomassé: the participants of any party can be placed at two round tables so that *neighbors* know each other at one table but do not know each other at the other table.