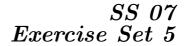


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## Extremal Combinatorics

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## Exercise 1

The k-color Ramsey Number  $R_k(G)$  is the largest integer m for which one can color the edges of  $K_m$  with k colors such that there is no monochromatic copy of G.

Show that  $R_k(K_{3,3}) = (1 + o(1))k^3$ .

## Exercise 2

Using Füredi's idea together with the projective norm-graphs prove that for any fixed t

 $\lim_{s \to \infty} (\liminf_{n \to \infty} ex(n, K_{t,s}) n^{-(2-1/t)}) = \infty.$ 

In particular for t = 3, give a construction such that the known upper bound of  $ex(n, K_{3,s})$  comes within a factor of  $2^{-\frac{1}{3}} + o(1)$  of the lower bound for every  $s \ge 3$ ,  $s = 2r^2 + 1$ ,  $r \in \mathbb{Z}$ .