

Class worksheet 10: Combinatorics and Graphs 1

December 13, 2023

Name: _____

This is just to practice, no points are awarded.

1. Prove that $R(3, 3) = 6$. In the lecture we only proved that $R(3, 3) \leq 6$.
2. Prove that for every k there exists n such that among any n points in \mathbb{R}^2 in general position (no three are on the same straight line) there will be some k of them forming a convex polygon. **Hint:** colour a quadruple of points red if they are in convex position, and blue otherwise. Then what?
3. Prove that $R(3, 4) \leq 9$.
4. Let F be a finite collection of binary strings of finite lengths and assume no member of F is a prefix of another one. Let N_i denote the number of strings of length i in F . Prove that

$$\sum_i \frac{N_i}{2^i} \leq 1.$$