

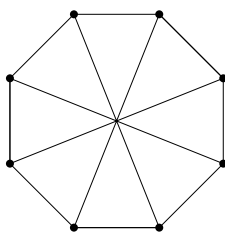
Discrete Maths I Review

Do date: Oct 14th 8:30 AM, during the exercise class.

This sheet is intended to help you review some concepts from Discrete Mathematics I that might be useful for this semester's course. If you would like to review these topics together, come to the exercise class on the 14th of October, where you will get to discuss and work on these problems in small groups.

Exercise 1

- (i) Determine the chromatic and independence numbers of the cycle C_n , and the following 8-vertex graph



- (ii) Show that for any graph G , $\frac{v(G)}{\alpha(G)} \leq \chi(G) \leq \Delta(G) + 1$, where $\chi(G)$ and $\alpha(G)$ denote the chromatic and independence numbers respectively. Can you find examples where these bounds are tight?

Exercise 2 Show that the largest triangle-free graph on 100 vertices has 2500 edges.

Exercise 3 State Euler's formula, and deduce a bound on the maximum number of edges that an n -vertex planar graph can have.

Exercise 4 Let $k \in \mathbb{N}$ be a constant. For each pair of functions $f(n)$ and $g(n)$ from the functions given below, determine whether $f = o(g)$, $f = O(g)$, or $f = \Omega(g)$ (as n tends to infinity):

$$\binom{n}{k}, n^{n^2}, 2^{2^{\log^2 n}}, 2^n, n!, \log n.$$