

“Combinatorics”

Problem Set 4

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Class homepage:
<http://carsten.codimi.de/comb07/>

4. Graphs

15. Classify all 3-regular graphs on 8 vertices up to isomorphism.
16. Let G be a k -connected graph, $A, B \subset V$ disjoint sets of vertices, and $|A| = |B| = k$.
 - (i) Show that there are k vertex disjoint paths in G , each leading from a vertex in A to a vertex in B .
 - (ii) Let $A = \{a_1, \dots, a_k\}$, $B = \{b_1, \dots, b_k\}$. Is it always true that there are vertex disjoint paths p_1, \dots, p_k with p_i leading from a_i to b_i for all i ?
17.
 - (i) Let G be a maximal plane bipartite graph with no vertex adjacent to all others. Show that G has only quadrilateral faces.
 - (ii) Show that any planar bipartite graph on $n > 2$ vertices has at most $2n - 4$ edges.
 - (iii) Show that $K_{3,3}$ is not planar.
18. Show that every finite planar graph contains a triangle, or a vertex of degree at most 3, or both.