Kombinatoryka & teoria grafów

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SYLABUS - teoria grafów:

1. Basic concepts: graphs, paths and cycles, complete andbipartite graphs
2. Matchings: Hall’s Marriage theorem and its variations
3. Forbidden subgraphs: complete bipartite and r-partite subgraphs, chromatic numbers, Tur"an’s thorem, asymptotic behaviour og edge density, Erd"os-Stone theorem
4. Hamiltonian cycles (Dirac’s Theorem), Eulerian circuits
5. Connectivity: connected and k-connected graphs, Menger’s theorem
6. Ramsey theory: edge colourings of graphs, Ramsey’s theorem and its variations, asymptotic bounds on Ramsey numbers
7. Planar graphs and colourings: statements of Kuratowski’s and Four Colour theorems, proof of Five Colour theorem, graphs on other surfaces and Euler chracteristics, chromatic polynomial, edge colourings and Vizing’s theorem
8. Random graphs: further asymptotic bounds on Ramsey numbers, Zarankiewicz numbers and their bounds, graphs of large firth and high chromatic number, cmplete subgraphs in random graphs.
9. Algebraic methods: adjavenvy matrix and its eigenvalues, strongly regular graphs, Moore graphs and their existence.

Contents

Definicja – to jest bardzo wyedukowany tekst w ramce

Troszke mniej wyedukowany tekst, bo jest poza fajna ramka ktora wyglada jak guwno i w sumie to nie wiem czemu ja ja w ten sposob ranie

1 Structural properties

1.1 The basics

Graph – an ordered pair $G = (V, E)$:

- ↪ vertices $:= V$ [singular *vertex*]
- ↪ edges $:= E$, $\{v, w\} := vw$

For an edge vw, $v \neq w$ we say that v, w are its endpoints and that it is incident to v (or w).

Dla krawedzi vw, $v \neq w$ mowimy, ze v, w sa jej koncami i ze jest krawedzia padajaca na v (lub w).

Graphs G and H are isomorfic ($G \simeq H$) if there exists $f : V(G) \xrightarrow[1-1]{\text{on}} V(H)$ such that $(\forall\, v, w \in V(G))\; vw \in E(G) \iff f(v)f(w) \in E(H)$

G is a subgraph of H [$G \leq H$] if $V(G) \subseteq V(H)$ and $E(G) \subseteq E(H)$.

If G is H-free if it is has no subgraphs isomorfphic to H.