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Graph Structures

Proposition 1.0.1

Every non-empty graph G has a subgraph H such that $\delta(H) \geq \frac{1}{2}\bar{d}(G)$.

Theorem 1.0.2 ► Erdos-Gallai Algorithm

A non-increasing sequence (d_1, d_2, \dots, d_n) is graphic if and only if $\sum_{i=1}^n d_i$ is even and for all $k = 1, 2, \dots, n$,

$$\sum_{i=1}^k d_i \leq k(k-1) + \sum_{i=k+1}^n \min\{d_i, k\}.$$

Proposition 1.0.3

Let \mathbf{M} and \mathbf{A} be the incidence matrix and adjacency matrix of a simple graph G respectively, then

$$\mathbf{M}\mathbf{M}^T = \begin{bmatrix} d_1 & 0 & 0 & \cdots & 0 \\ 0 & d_2 & 0 & \cdots & 0 \\ 0 & 0 & d_3 & \cdots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \cdots & d_n \end{bmatrix} + \mathbf{A}.$$