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Problem 13

Theorem 1.1. *If a graph has an ear-decomposition, then it is* 2*-connected.*

Proof. By *Menger's Theorem*, a graph G is k-connected if and only if for any two vertices a, b in G there exist k independent a-b-paths. We find those 2 paths for any ear-composable graph. $\square$

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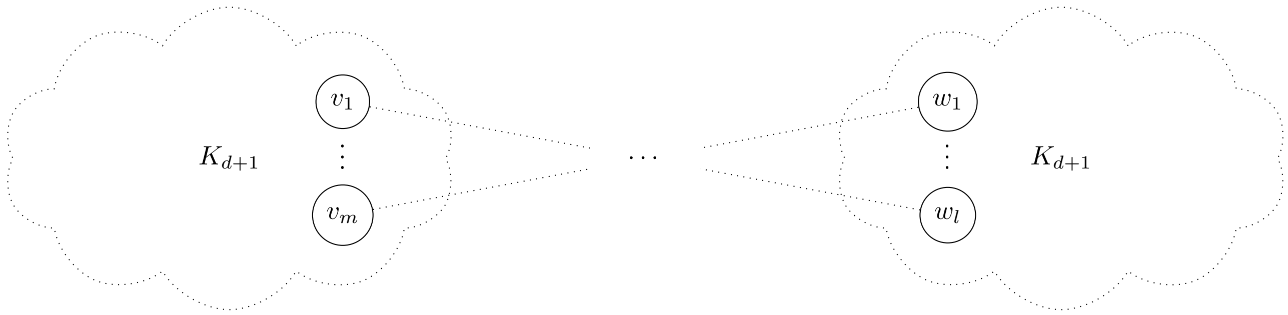
Problem 14

For $0 < l < m \leq d$, we will construct a graph $F(d, l, m)$ with

- $\delta(F(d, l, m)) = d$
- $\kappa(F(d, l, m)) = l$
- $\kappa'(F(d, l, m)) = m$



Problem 15

I will prove that any block-cut-vertex graph is a tree, by showing by contradiction that any block-cut-vertex graph is acyclic and connected.

Theorem 3.1. *The block-cut-vertex graph $G = (V, E)$ of any connected graph $G' = (V', E')$ is a tree.*

Proof. Let's assume for the sake of contradiction that G has a cycle $C = (b_1 b_2 ... b_1)$. Then, the C induced subgraph of G is 2-connected, because obviously each pair $b_i, b_j \in C$ is connected by two distinct paths. $\square$

Problem 16