Dissertation Defense

3-Connected, Claw-Free, Generalized Net-Free Graphs are Hamiltonian

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Abstract: Given a family $\mathcal{F} = \{H_1, H_2, \ldots, H_k\}$ of graphs, we say that a graph is $\mathcal{F}$-free if G contains no subgraph isomorphic to any H_i, $i = 1, 2, \ldots, k$. The graphs in the set $\mathcal{F}$ are known as *forbidden subgraphs*. The main goal of this dissertation is to further classify pairs of forbidden subgraphs that imply a 3-connected graph is hamiltonian. First, the number of possible forbidden pairs is reduced by presenting families of graphs that are 3-connected and not hamiltonian. Of particular interest is the graph $K_{1,3}$, also known as the *claw*, as we show that it must be included in any forbidden pair. Secondly, we show that 3-connected, $\{K_{1,3}, N_{i,j,0}\}$-free graphs are hamiltonian for $i, j \neq 0, i + j \leq 9$ and 3-connected, $\{K_{1,3}, N_{3,3,3}\}$-free graphs are hamiltonian, where $N_{i,j,k}$, known as the *generalized net*, is the graph obtained by rooting vertex-disjoint paths of length i, j, and k at the vertices of a triangle. These results combined with previous known results give a complete classification of generalized nets such that claw-free, net-free implies a 3-connected graph is hamiltonian.

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