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Introducing 3-Path Domination in Graphs

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Abstract of Report Talk: The *dominating set* of a graph G is a set of vertices S such that for every $v \in V(G)$ either $v \in S$ or v is adjacent to a vertex in S. The *domination number*, denoted $\gamma(G)$, is the minimum number of vertices required to construct a dominating set. In 1998, Haynes and Slater introduced paired-domination. A *paired-dominating* set is a dominating set whose induced subgraph contains a perfect matching. The *paired-domination number*, denoted $\gamma_{pr}(G)$, is the minimum number of vertices needed to construct a paired-dominating set. Building on paired-domination, we introduce 3-path domination. We define a *3-path dominating set* of G to be $S = \{P_1, P_2, \ldots, P_k | P_i \text{ is a 3-path}\}$ such that the vertex set $V(S) = V(P_1) \cup V(P_2) \cup \cdots \cup V(P_k)$ is a dominating set. We define the *3-path domination number*, denoted by $\gamma_3(G)$, to be the minimum number of 3-paths needed to dominate G. We have shown that the 3-path domination problem is NP-complete. Therefore, it is of interest to find bounds on and formulas for γ_3 of particular families of graphs such as Harary graphs, Hamiltonian graphs, and subclasses of trees. We will share these results. This material is based upon work supported by the National Science Foundation under grant no. DMS 1757616.

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