SOME PROGRESS ON THE DOUBLE ROMAN DOMINATION IN GRAPHS

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Abstract

For a graph $G = (V, E)$, a double Roman dominating function (or just DRDF) is a function $f : V \rightarrow \{0, 1, 2, 3\}$ having the property that if $f(v) = 0$ for a vertex $v$, then $v$ has at least two neighbors assigned 2 under $f$ or one neighbor assigned 3 under $f$, and if $f(v) = 1$, then vertex $v$ must have at least one neighbor $w$ with $f(w) \geq 2$. The weight of a DRDF $f$ is the sum $f(V) = \sum_{v \in V} f(v)$, and the minimum weight of a DRDF on $G$ is the double Roman domination number of $G$, denoted by $\gamma_{dR}(G)$. In this paper, we derive sharp upper and lower bounds on $\gamma_{dR}(G) + \gamma_{dR}(\overline{G})$ and also $\gamma_{dR}(G)\gamma_{dR}(\overline{G})$, where $\overline{G}$ is the complement of graph $G$. We also show that the decision problem for the double Roman domination number is NP-complete even when restricted to bipartite graphs and chordal graphs.

Keywords: Roman domination, double Roman domination.

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References

