



## Roman entire domination in graphs

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### Abstract

A *Roman entire dominating function* on a graph  $G = (V, E)$  is a function  $h : Z = V \cup E \rightarrow \{0, 1, 2\}$  satisfying the condition that each element  $x \in Z$  for which  $h(x) = 0$  is either adjacent to or incident with at least one element  $y \in Z$  with  $h(y) = 2$ . The weight of a Roman entire dominating function is the value  $w(h) = \sum_{x \in Z} h(x)$ . The

*Roman entire domination number* of a graph  $G$ , denoted by  $\gamma_{ren}(G)$ , is the minimum weight of a Roman entire dominating function on  $G$ . In this paper, we obtain several bounds for  $\gamma_{ren}(G)$ . We also investigate the behavior of  $\gamma_{ren}(G)$  when a vertex or an edge is deleted.

**Keywords:** Dominating set, Entire dominating set, Roman dominating function, Roman entire dominating function.

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## 1 Introduction

Cockayne et al. [3] introduced the concept of Roman dominating function (RDF) (See also [2, 4, 6]). A Roman dominating function on a graph  $G = (V, E)$  is a function  $f : V \rightarrow \{0, 1, 2\}$  satisfying the condition that every vertex  $u$  for which  $f(u) = 0$  is adjacent to at least one vertex  $v$  such that  $f(v) = 2$ . The weight of a Roman dominating function is the value  $w(f) = \sum_{u \in V} f(u)$ . The Roman domination number of a graph  $G$ , denoted by  $\gamma_r(G)$ , is the minimum weight of a Roman dominating function on  $G$ .

A Roman edge dominating function (REDF) on a graph  $G = (V, E)$  is a function  $g : E \rightarrow \{0, 1, 2\}$  satisfying the condition that every edge  $e_1$  for which  $g(e_1) = 0$  is adjacent to at least one edge  $e_2$  such that  $g(e_2) = 2$ . The weight of a Roman edge dominating function is the value  $w(g) = \sum_{e \in E} g(e)$ . The Roman edge domination number of a graph  $G$ , denoted by  $\gamma_{re}(G)$ , is the minimum weight of a Roman edge dominating function on  $G$ . This concept was studied by Soner et al. in [7].

In this paper, we introduce the concept of Roman entire dominating function and initiate a study of the Roman entire domination number.

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