

ABSTRACT

DISTANCE k -DOMINATION NUMBER AND INVERSE DISTANCE k -DOMINATION NUMBER OF THE SIERPINSKI STAR GRAPH

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As Research on domination parameters in graph theory continues to grow, particularly in the area of distance-based domination. One interesting extension is the distance k -domination number and the inverse distance k -domination number, which consider the coverage range of vertices within a certain distance as well as redundancy properties in a system. However, studies concerning the inverse distance k -domination number are still limited, especially for graphs with recursive structures such as the Sierpinski Star graph. This study aims to determine the distance k -domination number and the inverse distance k -domination number of the Sierpinski Star graph SS_n for $n \geq 1$. The method used is an analytical approach by utilizing the recursive properties of the Sierpinski Star graph and constructing optimal dominating sets. The determination process is carried out by identifying domination patterns in several initial iterations and then generalizing them for more general values of n and k . The results show that the distance k -domination number of the Sierpinski Star graph follows a particular recursive pattern depending on the graph iteration level. In addition, the inverse distance-2 domination number and inverse distance-3 domination number are obtained, along with a general formulation for the inverse distance k -domination number. These findings indicate that the self-similarity structure of the Sierpinski Star graph plays an important role in determining domination patterns and enables the derivation of generalizations for the parameter k . This research is expected to contribute to the development of domination theory in graphs, particularly in the study of distance-based domination and inverse domination on recursive graphs.

Keywords: *distance k -domination, inverse domination, inverse distance k -domination, Sierpinski Star graph.*