

# Sombor Index and Its Variations for different Powers of Path Graphs

## Abstract

The Sombor index, a novel topological index for graphs, and its associated variants such as Reduced Sombor Index, Average Sombor Index, Sombor coindex, First Zagreb–Sombor Index and the Second Zagreb–Sombor Index etc. has recently emerged as an effective degree-based descriptor in the domains of chemical graph theory, bio-network analysis, and engineered systems. In this paper, we compute these indices for different powers of path graphs and derive explicit formulas for each case. Our observations indicate that these indices for powers of path graphs are influenced by the graphs' powers. The result provides closed-form solutions and examine the impact of graph powering on these indices. In conclusion, the paper ends with several open questions and directions for future research.

**Keywords**— Sombor index, Reduced Sombor index, Average Sombor index, Sombor coindex, Zagreb index, Graph powers