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**Susan Margulies\***, margulie@usna.edu, and **Elisabeth Gaar, Daniel Krenn** and **Angelika Wiegele**. *Two Optimization-based Approaches for Computational Proofs of Vizing's Conjecture*. Preliminary report.

Vizing's conjecture (open since 1968) relates the size of dominating sets in graphs  $G$  and  $H$  to the size of a dominating set in the product graph  $G \square H$ . In this paper, we formulate Vizing's conjecture itself as two different ideals, thus relating the conjecture to the question of 1) is there a Postivstellensatz or sum-of-squares certificate for a given polynomial, or 2) is the variety associated with the specified ideal empty, i.e., does there exist a Hilbert's Nullstellensatz certificate of infeasibility. In this paper, we present the theoretical structure of both computer-based proofs, and demonstrate the sum-of-squares approach as a problem in semidefinite optimization, and the Hilbert's Nullstellensatz certificate of infeasibility approach as a problem in linear algebra. We also present preliminary computational results. (Received September 26, 2017)