1067-68-191   **Eddie B Tu** (eddietu@students.rmc.edu), 10513 Creston Road, Glen Allen, VA 23060, and **Bjorn S Wastvedt*** (bjorn.wastvedt@gmail.com), 435 West Neshannock Avenue, New Wilmington, PA 16142. *Applications of and Alternatives to Algorithm X for the Exact Cover Problem.*

Currently, the best algorithm for solving the NP-Complete Exact Cover problem is Donald Knuth's Algorithm X. Motivated by its efficiency, our work investigates conversion of other NP-Complete problems to Exact Cover form. We present an improvement on Sage's reformulation of Vertex Coloring problems to Exact Cover problems by using partial complete graph decompositions. This improvement generalizes the observation that the popular logic puzzle Sudoku is both an Exact Cover problem and a Vertex Coloring problem. After proving that chromatic polynomials cannot be used to find colorings of most arbitrarily partially-colored graphs, we turn to our method of conversion to find solutions. To solve the converted Vertex Coloring problem as well as the general Exact Cover problem, we present a detailed explanation of Algorithm X followed by an investigation into a new algorithm we developed to reduce any Exact Cover problem to a smaller exponential problem. Future research will address the comparative efficiency of these two algorithms in various conditions. (Received July 29, 2010)

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