1116-14-1011 **Aaron Tyler Wagner*** (awagne18090@viterbo.edu), 710 8th Street South, Clare Apartments, #302, La Crosse, WI 54601, and **Kainalu Barino**, **Monica Busser** and **Vanessa Aguirre**.

Determining Unique Hamiltonicity Using Gröbner Bases.

Recent advances in computational algebraic geometry by De Loera et al. allow us to recognize certain graph theoretic properties, such as graph colorability and Hamiltonicity with polynomial ideals. These results allow us to test for such properties in an automated way using the computer. We employ these results to develop and implement algorithms written in the mathematical software system `Sage` to systematically test various combinatorial conjectures in graph theory. In particular, we have used our methods to test Sheehan's Conjecture (1975) which states that every Hamiltonian 4-regular graph has at least two distinct Hamiltonian cycles. Our results verify Sheehan's Conjecture for 4-regular graphs on up to 10 vertices and give support for other combinatorial conjectures. Our software can be easily modified to test other combinatorial conjectures for graphs. (Received September 16, 2015)