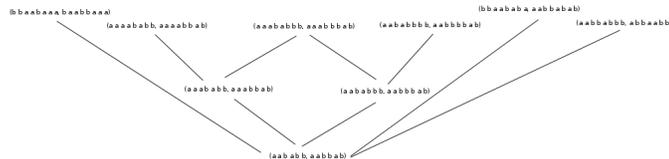# Student Research Talks (StReeTs)

Mason Experimental Geometry Lab (MEGL)

Special Words in Free Groups

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Abstract

This talk represents joint work with Patrick Bishop, Sean Lawton, and Mary Leskovec. We study elements of the rank 2 free group, F_2, which are known as words. Each word has an associated trace function whose domain is SL_n and whose range is $\mathbb{C}$. We consider two words to be special in relation to each other if they are not conjugate to each other but have the same trace function. Words are considered 2-special if they have the same trace function when $\mathsf{SL}_2\mathbb{C}$ is the domain, 3-special if $\mathsf{SL}_3\mathbb{C}$ is the domain, and so on. Previous research has shown that there are unboundedly many 2-special words and that a word, its inverse, and its reverse will always be 2-special. It is not known if 3-special words exist, but it is known that if words are 3-special then they are also 2-special and that a word will never be 3-special with its inverse. Our goal is to develop necessary and sufficient conditions for the existence of 3-special words. To study this, we wrote computer programs to generate all 2-special words of a specified length and search the data set for 3-special words. In the data set of over 20 million words, there are no 3-special words. We have proven that words must have the same exponents in order to be 3-special, decreasing the amount of words that can be 3-special. We also investigate the application to algebraic geometry that the existence or non existence of 3-special words has.

Date: Friday, April 28, 2017
Time: 2:30pm–3:30pm
Place: Exploratory Hall 4106
Pizza and soda will be served at the presentation.