

An Overview of k -Harold and k -Audrey, the Ihara Zeta Function, and Seidel Switching

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This talk will cover two topics:

1.) *k -Harold and k -Audrey*: The pair of graphs known as Harold and Audrey are non-isomorphic, arithmetically equivalent graphs. The origin of Harold and Audrey will be introduced and followed by the explanation of an infinite set of pairs of graphs maintaining many of the same characteristics of the original Harold and Audrey. A brief background of the Ihara zeta function will also be included.

2.) *Seidel Switching*: Does the spectrum of a graph determine its shape? Seidel switching is a technique for generating pairs of graphs that are cospectral but not necessarily isomorphic, thus telling us that the shape of a graph cannot be determined by its spectrum. Gregory Quenell explored Seidel switching in *The Combinatorics of Seidel Switching* in order to answer this very question. We will introduce how to construct a pair of graphs via the Seidel technique and illustrate the construction via example. The construction can also be restricted in order to generate cospectral pairs of regular graphs. This is of interest because cospectral pairs of regular graphs are rarer than cospectral pairs of non-regular graphs.