Power domination and zero forcing: Using graphs to model real-world problems

Abstract: A graph $G = (V, E)$ is a set of vertices $V = \{1, \ldots, n\}$ and set of edges $E$ of two element sets of vertices. A graph can be used to model connections between vertices, such as airline routes between cities, internet connections, a quantum system, or an electric power network.

Power domination and zero forcing are related coloring processes on graphs. We start with a set of vertices colored blue and the rest colored white. We apply a color change rule to color the white vertices blue. A set of blue vertices that can color all vertices blue by using the power domination color change rule (or zero forcing color change rule) is called a power dominating set (or a zero forcing set). Finding a such set allows us to solve various problems, and a minimum such set can provide an optimal solution.

In an electric power network, a power dominating set (blue vertices) gives a set of locations from which monitoring units can observe the entire network. In a quantum system, a zero forcing set (blue vertices) gives a set of locations from which the entire system can be controlled.

This talk will describe power domination and zero forcing processes on graphs and some of their applications.

Lunch: Sign up for a free mentoring lunch for female students after the talk at the program’s website.

This event is part of the program Women Doing Math funded by the Mathematical Association of America – Tensor Program for Women and Mathematics.

Thursday April 27, 11am – 12pm • UAC 474

Women Doing Math
A program to encourage women to participate in creating Mathematics
http://womendoingmath.wp.txstate.edu/