Math Factor/Math Department Seminar

Marie Kramer
Wed, Jan 29 - TY 365

Dr. Kramer is a candidate for a faculty position in the Math Dept. Her presentation will consist of two short parts: one part is a teaching topic and the second part is her research area.

Teaching Demonstration – 1:30 – 2:10

Topic: What the First Derivative of a Function Tells Us About the Shape of its Graph

Outline: We will first review the connection between the first derivative and tangent lines. Then discuss the relationship between sign of the first derivative and intervals where the graph is increasing/decreasing as well as local extreme points. The discussion will include pictures to visualize the situation and examples.

Research Talk – 2:20 – 3:00

Title: Graph Embeddings and Obstructions

Abstract: One of the most well-known results in graph theory is Kuratowski's Theorem characterizing planar graphs. A graph is planar if it can be drawn in the plane without edges crossing, and such a drawing is called an embedding of the graph into the plane. Kuratowski showed that a graph is planar if any only if it does not contain the complete graph K_5 or the complete bipartite graph $K_{3,3}$. We call K_5 and $K_{3,3}$ obstructions for the plane. Moreover, the embeddability of these two graphs into the torus and the real projective plane has been studied by Gagarin, Kocay, Neilson, and Mohar. In the spirit of Kuratowski's Theorem, one might ask which graphs are obstructions for other surfaces. This question was solved for the real projective plane by Glover, Huneke, Wang, and Archdeacon. For other surfaces, there are at best partial results. In this talk, we will investigate the embeddability of a special class of projective plane obstructions into the torus. Moreover, we will discuss a special class of small torus obstructions.