

CENTRAL MICHIGAN UNIVERSITY

Department of Mathematics

COLLOQUIUM

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When Graph Theory Meets Analysis

Tuesday, January 25, 4:00 p.m. – 5:00 p.m.
Pearce Hall, Room 226

Coffee and Cookies 3:30 p.m. – 4:00 p.m.
Pearce Hall, Room 216

ABSTRACT

It is well known in elementary math courses that if a continuous function maps a closed interval into itself, then it has a fixed point. Fixed points of a map f and convergence of the iterates of f at points in its domain have been widely investigated in many branches of mathematics and its applications. Fixed points of the iterates of f are called cycles, or periodic solutions of the difference equation $x_{n+1}=f(x_n)$, and as in fixed points (or steady states), they help us understand the dynamics of the difference equation in general. Associating a periodic solution of $x_{n+1}=f(x_n)$ to a digraph called “Straffin graph” has been a very interesting approach toward understanding the relationship between the cycles of f .

In a more general setting, one can consider the difference equation $x_{n+1}=f(n,x_n)$, which can be used to model certain populations in fluctuating environments. Characterizing the periodic solutions of $x_{n+1}=f(n \bmod p,x_n)$ has been a hot topic of research in the past few years. However, some questions remain unanswered. In this talk, we discuss some recent results on this problem, and generalize the notion of Straffin graphs, which helped us to solve some open questions in the past year. In particular, we find that when graph theory meets analysis, several challenging and lengthy results in analysis become relatively manageable.