Topology, Arithmetic, & Dynamics Seminar

How to do Multivariable Calculus on Graphs

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Multivariable calculus studies vector fields and associated operators such as the gradient and divergence in Euclidean space. This generalizes to smooth Riemannian manifolds as the exterior calculus. Recently there has been interest in defining discrete analogs of the exterior calculus on simplicial complexes. In this talk we go even further and present a generalization of the exterior calculus to graphs. To achieve this, the exterior calculus on smooth manifolds is first reformulated entirely in terms of the eigenvalues and eigenfunctions of the Laplacian operator. We call this reformulation the Spectral Exterior Calculus (SEC). We then transfer this formulation to a general graph using the eigenvalues and eigenvectors of the graph Laplacian. In numerical experiments we show that coarse-grained topological features of a graph are reflected in the SEC.

Date: **Friday, February 9, 2018**
Time: **2:30-3:20 pm**
Place: **4106 Exploratory Hall**

For special accommodations, please contact Sean Lawton via email at `slawton3@gmu.edu`.