

BI-CO MATHEMATICS COLLOQUIUM

Xiang Wan

Haverford College

***“Poisson Equations in Two-dimensional Domains
with Line Fracture: from Qualitative to
Quantitative Analysis”***

Monday, September 13, 2021

Talk at 4:00 – Park 338

Tea at 3:30 – Park 361, Math Lounge

Abstract:

In this talk, we will investigate the 2-d Poisson equations with the right hand side being a Dirac delta function on a line segment, modeling a singular line fracture. Numerically, such a fracture imposes additional treatment of the meshing while constructing the Finite Element space. In particular, inspired from the 1-d problem, we will see that a graded meshing is called for, where the grading depends on the distance to the fracture.

In order to achieve the optimal convergence rate, one has to look closer to the regularity of the solution in weighted Sobolev spaces - in contrast to the classic regularity results in (standard) Sobolev spaces from the Elliptic theory of PDEs. Both an outline of the proof to these regularity results and some numerical demonstration will be presented.