R H I T

M A T H E M A T I C S C O L L O Q U I U M

Wednesday, April 21, 2004

Room G-219 Crapo Hall

7th period
(1:35 - 2:25 p.m.)

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Will present

Viscosity Solutions to PDEs - Part I: What are they?

Abstract: In studying PDEs, there are various notions of a solution depending on the context of the problem. For instance, in examining Poisson's equation

$$\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=f(x,y)$$

,

a classical solution is one that is twice differentiable and satisfies the equation, which requires that $f(x,y)$ be continuous, while a weak solution is one that satisfies the weak version of Poisson's equation

$$\iint \nabla\varphi\cdot\nabla u\,dxdy=-\iint f(x,y)\,\varphi(x,y)\,dxdy$$

for all smooth test functions $\varphi(x,y)$ which only requires that $f(x,y)$ be square integrable, but the solution $u(x,y)$ is not necessarily even continuous. In this talk, I will introduce the idea of a viscosity solution primarily through examples, and contrast it to the idea of a classical solution and a weak solution.