

# MANY CHEERFUL FACTS

presents

## Fixed-Point Techniques in Calculus

a talk by Kiril Datchev

11:10 am - 12:00 on Wednesday, February 15th, in room 1015.

An old theorem says that a function on a complete metric space which uniformly shrinks distances must have a unique fixed point. With a little extra work one can show that if a family of such functions depends smoothly on a parameter, then the location of fixed point too depends smoothly on the parameter. Using this result one can derive the implicit and inverse function theorems, as well as existence and uniqueness of solutions to ordinary differential equations, all in a very slick way. This talk will explain how to do these things.

*I am the very model of a modern Major General,  
I've information vegetable, animal, and mineral,  
I know the kings of England, and I quote the fights historical  
From Marathon to Waterloo, in order categorical;  
I'm very well acquainted, too, with matters mathematical,  
I understand equations, both the simple and quadratical,  
About binomial theorem I'm teeming with a lot o' news,  
With many cheerful facts about the square of the hypotenuse!*

- Gilbert & Sullivan  $P \circ P$