MSRI–Evans Talk

Monday, 4:10–5:00pm, 60 Evans

Oct. 6 **Michael Taylor**

Gibbs Phenomena, Pinsky Phenomena, and Nonlinear Schrodinger Equations

For partial Fourier inversion of a compactly supported, piecewise smooth function on the real line, with jump discontinuities, the Gibbs phenomenon is manifested by a persistent overshoot close to the jumps by the family of approximations, which converge uniformly away from the jumps. A similar phenomenon arises for the short time solution operator to the linear Schrodinger equation.

These phenomena have analogues in higher dimensions, where such a function might have a jump across a smooth, codimension-one surface. Again, one can make uniform analyses of the approximations near the jumps. Additional, nonlocal phenomena appear in higher dimensions. These nonlocal effects can be understood as focusing effects. They arise where the evolution of the surface of discontinuities produces caustics. When the surface is a sphere, one has a perfect focus caustic at the center. For other surfaces of discontinuity, gentler caustics are produced.

Such piecewise smooth functions form an interesting class of initial data for nonlinear Schrodinger equations. I will discuss some results on short time solvability for NLS and qualitative behavior of the solutions in such cases, touching on some recent work by my student Ben Dodson.