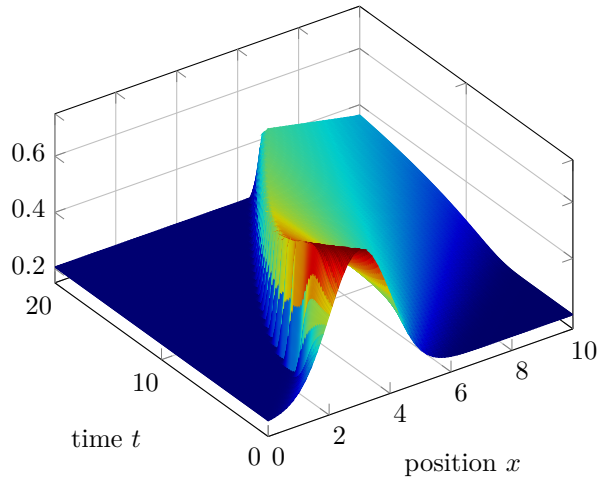
APM 577 - Theory of PDE II (Spring 2018)



- Instructor: Sebastien Motsch (email: `smotsch@asu.edu`)
- Class: T,Th 10:30-11:45 (WXLRA 302)
- Class webpage: `www.seb-motsch.com/graduate`

Textbook: L. Evans, *"Partial Differential Equations"* (2nd edition)

Course Description

This course introduces rigorous methods to study partial differential equations such as existence theory and global behavior of solutions. The goal is to understand *intuitively* PDEs and then to develop analytic skills to *prove* results. This class is intended to be spread over two semesters, the first semester will be focused on **linear PDEs** (e.g. elliptic, parabolic equations) and the second semester on **non-linear PDEs** (e.g. conservation laws, reaction diffusion).

The course is divided into three parts:

a) **Introduction** (*chap. 3*): we will review some examples of first order non-linear PDEs (conservation laws, Hamilton Jacobi) and study *formally* their behaviors.

b) **Nonvariational methods** (*chap. 9.1-9.3*): fixed point methods to solve non-linear elliptic equations (e.g. $-\nabla \cdot (a(\nabla u)) = f$) and reaction-diffusion (i.e. $\partial_t u = \Delta u + f(u)$).

c) **Systems of conservation laws** (*chap. 11*): Traveling waves solution to systems $\partial_t \mathbf{u} + \partial_x f(\mathbf{u}) = 0$, entropy conditions.