

Qualitative properties of solutions to semilinear elliptic PDEs

Dott. Daniele Castorina

*Università degli Studi di Padova
Dipartimento di Matematica
Email: castorin@math.unipd.it*

Timetable: 20 hrs. First lecture on March 3rd, 2015, 14:00 (dates already fixed, see the calendar), Torre Archimede, Room 2BC/30.

Course requirements: Standard knowledge of Advanced Calculus

Examination and grading: Seminar on a subject assigned by the Instructor

SSD: MAT/05 (Mathematical Analysis)

Aim: The course will cover the maximum principle for second order elliptic partial differential operators and its applications to the study of qualitative properties of solutions to semilinear reaction-diffusion problems.

Course contents:

1. General facts about elliptic operators.
2. Weak maximum principle.
3. Hopf lemma.
4. Strong maximum principle.
5. Moving plane method and Gidas-Ni-Nirenberg theorem.
6. Corollaries and applications of Gidas-Ni-Nirenberg theorem.
7. Serrins overdetermined problem.
8. Alexandroff-Bakelman-Pucci estimate.
9. Maximum principle in small domains.
10. Sliding method and Berestycki-Nirenberg theorem.

References

- Berestycki-Nirenberg, On the method of moving planes and the sliding method. Bol. Soc. Brasil. Mat., (N.S.), 22, p.13, (1991).
- Gilbarg-Trudinger, Elliptic partial differential equations of second order. Springer, (1998).
- Gidas-Ni-Nirenberg, Symmetry and related properties via the maximum principle. Comm. Math. Phys., 68, p.209-243., (1979).
- Serrin, A symmetry problem in potential theory. Arch. Rat. Mech. Anal., 43, p. 304-318, (1971).