Math177: Geometric Methods in PDE

MoWe 12:50 – 2:05pm, 381T

Instructor: Yakov Eliashberg

1. Recollections of basic notions and results in the theory of ODE.
2. Symmetries of differential equations.
3. Resolution of singularities of differential equations.
4. Implicit equations. Legendre transform and projective duality.
5. First order partial differential equations and ODE. Hamilton-Jacobi equation.
6. Elements of symplectic, contact and Poisson geometry.
7. Differential equations and variational principles of Classical Mechanics.
8. Lagrangian and Hamiltonian formalisms on Mechanics.
9. Hamiltonian vector fields and their dynamics. Periodic orbits of Hamiltonian systems and fixed points of canonical transformations.
10. Completely integrable systems. Liouville-Arnold theorem and applications.
11. The problem of structural stability.
12. Differential equations on the 2-torus and the theory of diffeomorphisms of the circle.
13. Introduction to the hyperbolic theory. Anosov systems and Smale's horseshoe example.
14. Introduction to the method of normal forms.