

Math 8172
Spring 2019

1. Harmonic functions. Mean value properties. Fundamental solutions. Green's identities. Maximum principles.
2. Sobolev spaces. Sobolev's inequality, Poicare's inequality, Reillich-Kondrachov's inequality.
3. Elliptic equations
 - a. Dirichlet problems. Existence and uniqueness of weak solutions. Lax-Milgram theorem and compactness arguments. Maximum principle. A connection with variational method.
 - b. Neumann problems. Existence and uniqueness of weak solutions. Lax-Milgram theorem and compactness arguments. A connection with variational method.
 - c. Robin problems. Existence and uniqueness of weak solutions. Lax-Milgram theorem and compactness arguments. A connection with variational method.
 - d. Laplace equation in unbounded domains.
4. Parabolic equations
 - a. Existence and uniqueness of weak solutions.
 - b. Energy estimates.
 - c. Maximum principle.
5. Hyperbolic equations:
 - a. Existence and uniqueness of weak solutions.
 - b. Energy estimates.
6. The application of Fourier transform to PDEs.