

MAT 418/518 – Midterm Topics

- I. Second Order PDEs
 - a. Classification of Second Order PDEs
 - b. Method of Separation of Variables
 - c. Dirichlet/Neumann/Periodic Boundary Conditions
 - d. Boundary Value Problems
 - e. Heat Equation
 - f. Wave Equation
 - i. Harmonics
 - ii. d'Alembert's solution
 - g. Laplace's Equation
 - i. BCs on Rectangle
 - h. Nonhomogeneous Boundary Conditions
 - i. Steady-state solutions
 - ii. Duhamel's Principle
- II. Fourier Series
 - a. Direct Computation
 - b. Periodic Extensions
 - c. Convergence
 - d. Fourier Sine/Cosine Series
 - e. Method of Solution for Linear PDEs
 - f. Orthogonality
- III. Numerical Solutions of PDEs – *Depends if I cover d.*
 - a. Finite Differences
 - i. Forward difference
 - ii. Backward difference
 - iii. Center difference
 - b. Truncation Error
 - c. Stability analysis
 - d. Matrix Methods
- IV. Miscellaneous
 - a. First Order ODEs
 - i. Separable
 - ii. First Order
 - b. Second Order ODEs
 - i. Constant Coefficient
 - ii. Cauchy-Euler
 - iii. Undetermined Coefficients
 - c. Basic Integration Techniques
 - d. Trigonometric Identities
 - e. Hyperbolic Functions
 - f. Green's Identity
 - g. Initial and Boundary Value Problems.