

MATH 417 — Numerical Methods

Notes taken by Lukas Zamora

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Heat Equation

Conduction of Heat in a 1-Dimensional rod, boundary conditions, equilibrium temperature distribution, heat condition in 2 or 3 dimensions. [1]

Method of Separation of Variables

Linearity, heat equation with zero temperatures at finite ends, orthogonality of functions, Laplace's equation; solutions and qualitative properties. [2]

Fourier Series

Statement of Convergence Theorem, Fourier cosine and sine series, term-by-term differentiation of Fourier series, term-by-term integration of Fourier series, complex form of Fourier series. [3]

Wave Equation

Vertically vibrating string, boundary conditions, vibrating string with fixed ends, vibrating membrane, reflection and refraction of electromagnetic and acoustic sound waves. [4]

The Method of Characteristics for Linear and Quasilinear Wave Equations

Characteristics for first order wave equations, method of characteristics for first order PDEs, one-dimensional wave equation, a vibrating string of fixed length, many quasilinear PDEs, semi-infinite strings and reflections. [12]

Fourier Transform Solutions of Partial Differential Equations

Heat equation on an infinite domain, Fourier transform pair, inverse Fourier transform, convolution theorem. [10]

Greens Functions for Time-Independent Problems

Green's functions for boundary value problems for ODEs, method of eigenvalue expansion, nonhomogeneous boundary conditions. [9]

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