



Midterm Exam Outline

Math 104B: Numerical Analysis

Professor: Paul J. Atzberger

- Numerical Differentiation
 - forward difference formulas
 - backward difference formulas
 - $(n+1)$ -point formulas
 - round-off error instability
- Numerical Integration
 - numerical quadrature
 - Lagrange interpolation and quadrature
 - Trapezoidal Rule
 - Simpson's Rule
 - Closed Newton-Cotes Formulas
 - Open Newton-Cotes Formulas
 - degree of accuracy
 - composite integration
 - Gaussian quadrature
 - Legendre orthogonal polynomials
 - Multiple integrals
- Theory of Ordinary Differential Equations (ODEs)
 - Lipschitz continuity, convexity
 - Definition of well-posedness
 - Sufficient criteria for well-posedness
 - Uniqueness, existence, robustness to perturbations
- Numerical Approximation of ODEs
 - Euler's Method
 - truncation error
 - error bound
 - stability
 - Taylor Methods
 - Runge-Kutta Methods
 - explicit / implicit methods
 - second order methods
 - fourth order methods
 - Multistep Methods
 - Adams-Moulton Methods
 - Adams-Bashforth Methods
 - truncation error
 - stability