Midterm Exam Outline

Math 104B: Numerical Analysis
Professor: Paul J. Atzberger

- Theory of Ordinary Differential Equations (ODEs)
  - Lipschitz continuity both scalar and vector-valued functions
  - 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

- Convergence of Methods, Stability, and Stiffness
  - Consistency of methods
  - Definition of A-stable method
  - Stability region.
  - Stability of One-step Methods
  - Stability of Multi-step Methods
    - Root conditions
  - Convergence theory for One-step Methods
  - Convergence theory for Multi-step Methods
  - Stiff ODEs and performance of implicit vs explicit methods