Numerical Methods

Exam 2 Review Notes

CS 357 Fall 2013

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Interpolation

- Polynomials
  - N points → polynomial of degree n-1
    - 2 points for a 1st degree (linear polynomial)
    - 3 points for $ax^2 + bx + c\ etc.$
  - Monomials
    - Vandermonde system
    - Condition
  - Newton Form
    - Divided differences
  - Lagrange Form
  - Oscillations and error

Interpolation

- Splines
  - Continuity
  - Uniqueness
  - Degrees of freedom
  - Natural cubic spline

Root Finding

- Properties of the various methods
  - Bisection
  - Newton
  - Secant
- Be able to compute an iteration of each method
- Be able to tell under what conditions each may fail.
- Know he order of convergence of each (ie linear, superlinear, quadratic,..)
- Understand convergence criteria

Integration

- Trapezoid and composite trapezoid rule
- Simpson's and composite Simpson's rule
- Gauss quadrature
- Understand the properties of each method.
  - Understand and apply error estimates.
  - How many intervals required to achieve given accuracy.
- Be able to evaluate each form given a function, interval, and interpolation points.

Differentiation

- Forward, Backward, Central differences
- Richardson extrapolation
- Be able to compute each given a table of values
- Understand and be able to apply error estimates.
- Know the “big O” of each method.

Iterative Methods

- Jacobi
- Gauss-Seidel
- SOR
- Conjugate Gradient
- Understand differences and similarities.
- Be able to compute an iteration of each.
- Know convergence criteria.