List of topics

Chapter 1
Syllabus
1/sqrt(x)
Sources of error
Alternative floats
IEEE Floats
Fund. floating point props.
Condition numbers
   Sharp (elm-wise) vs. Weak
   (norms)
Condition number of Ax=b
Overall floating point error
Variance computation

Chapter 2
Best approx prob.
Integrals, inner-products, and
   measures
Weierstrauss approx. thm.
Orthogonal functions
Lagrange interpolant
Chebyshev nodes
Barycentric interp.
Newton interp.
Divided differences
Hermite interpolation
Splines
Piecewise interp.
Error equation

List of topics

Chapter 2
Splines

Chapter 3
Choice of h in derivatives
Poly interp for derivatives
Taylor series for derivatives
Trapezoidal rule
Simpsons rule
Piecewise approx. and
   integrals
Method of undetermined
   coefficients
Interpolatory quadrature
Degree of exactness
Node polynomial
Gaussian quadrature
Jacobi matrices

Jacobi matrices and
   orthogonal polynomials
Eigenvalues as zeros of
   orthogonal polynomials

Chapter 4
Nonlinear equation examples
Bisection
Bisection in floating point
Convergence of sequences
Rates of convergence
False position
Secant Method
Newton's method
Fixed point methods
Systems of nonlinear
   equations
Convergence of Newton's
   method

List of topics since Last Exam

Chapter 5

Introduction to ODEs
Forward and Back. Euler
Methods as large linear
    systems
One-step methods for ODEs
    (in general)
Midpoint method
Heun's method
Runge-Kutta methods
Consistency
Stability
Convergence
Global error
Step length control
A-stable methods
Stiff problems
Spectral methods for ODEs

Exam plan

Current plan (won't change unless I truly feel it's in your best interests to change)

- 8am-Friday – 7:59am Sat.?

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15   Fri 05/07 08:00a - 10:00a
22
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- **10am-Friday – 9:59am Sat.**

  - *(Unless someone tells me this is in violation of some rule and you'll cause me problems...)*

- Expect to spend multiple hours on this, 3? 6? <= 10

- **No collaboration** (remember, you all said you were okay with the tradeoffs here)

  - If someone asks for help, tell them you'll have to email the professor if they ask again because you don't want to risk your grade!

Types of problems to expect

Like homework questions.

Like book questions.

Some discussion questions – what topics from class are relevant?

Some implementation questions.

Like last time?

Some questions

Do I have to typeset my solutions?

- No, but...

- You have 24 hours, I expect *well* written solutions!

  - I'm not going to struggle to understand your answers. If I can't quickly identify where you solved the hard parts of the question, you'll lose points.

- You will have Latex for the exam (I'll release an overleaf document all setup for you...)

- Exams submitted on gradescope.

- One problems/page