

Math128a - Syllabus

Week	Date	Material
1	Jan 17	Calculus Review (CR): to Riemann integral
1	Jan 19	CR: Fundamental Theorem of Calculus. Begin Taylor Series (TS).
		Problem Set (PS) 1: CR Computer Lab (CL) 0: warmup
2	Jan 24	CR: Analysis of TS, applications
2	Jan 26	CR: Continue applications.
		PS 2: Taylor Series
3	Jan 31	Zeros and fixed points. To basic convergence theorem.
3	Feb 02	Orders of convergence, root finding iterations, chord and Newton method.
		PS 3: Zeros and fixed points. CL 1: Zeros and fixed points.
4	Feb 07	Algebraic systems, discretized boundary value problem (BVP), tri-diagonal linear systems.
4	Feb 09	LU solution of tri-diagonal systems, Newton method for discretized BVP.
		PS 4: Discretized BVP and its solution by Newton method. CL 2: Tri-diagonal solver, application to linear BVP, discretized BVP by Newton's method.
5	Feb 14	Interpolation. by polynomials: Lagrange and Newton forms. State error estimate.
5	Feb 16	Midterm 1: (CF \rightarrow discrete BVP)
		PS 5: Interpolation.
6	Feb 21	Error theorem, Hermite interpolation, 'basis cubics' for 2 points.
6	Feb 23	Variational formulation of 'natural' cubic splines (NCS).
		CL 3: Nonlinear discretized BVP by Newton's method. CL 4: Interpolation.
7	Feb 28	Tridiagonal system for NCS.
7	Mar 02	Least squares and orthogonal projection- inner products.
		CL 5: Splines.
8	Mar 07	Normal equations- best line, least squares polynomials.
8	Mar 09	Orthogonal functions, derived from eigenvalue problems, projection solution of BVP.
		PS 6: Least squares and orthogonal functions. CL 6: Spectral method solution of BVP.

Week	Date	Material
9	Mar 14	Numerical intergraion- Trapezoid rule, error = even powers of h , Simpson's rule.
9	Mar 16	Simpson rule = 'extrapolation' of trapexoid rule. Richardson extrapolation.
		PS 7: Numerical Integration. CL 7: Richardson Extrapolation.
10	Mar 21	ODE Prototypes. Initial Value Problems (IVP's).
	Mar 23	Midterm 2, (interpolation, numerical integration).
11	Apr 04	ODE's Reduction to 1rst order systems. Families of solutions. Selection of solutions by initial conditions.
11	Apr 06	Initial value problems (IVP) and boundary value problems (BVP). Minimal surface. 1rst order linear ODE's . 'Electron' example.
		PS 8: Numerical integration CL 7: Richardson extrapolation
12	Apr 11	Exponential solutions of constant coefficient linear homogenous ODE's and systems.
12	Apr 13	Inhomogenous linear systems. Numerical solutions of IVP by difference equations. Forward Euler. Local and global truncation error.
		PS 9: Review of basic ODEs
13	Apr 18	Analysis of global truncation error.
13	Apr 20	Higher order methods: Runge Kutta.
		CL 8: Numerical solutions of ODE.
14	Apr 25	Multistep methods- stable versus unstable.
14	Apr 27	Numerical solution of diffusion equation- 'forward' method and its stability.
		CL 9: Numerical solution of diffusion equation.
15	May 02	Numerical solution of diffusion equation by 'backward' method- unconditional stability.
15	May 04	Rehersal for the final exam.
16	May 09	Rehersal continued.

Final Exam

Thursday
May 18, 2006
8:00-11:00 am
4 Leconte Hall