SM 365 Introduction to Scientific Computing
Fall Semester 2011

Remarks:

(a) Answers to the odd-numbered questions are available on the course web site:

`http://www.usna.edu/Users/math/liakos/Sm365-Fall2011.htm`

Section(s)	**Title/*Note***	**Problems**
Intro 1.1	Overview of Topics (Pages 1-10) Algorithms Part 1	
1.1	Algorithms Part 2	1,2,4(a),5
	Review of MATLAB Part 1	Handout
	Review of MATLAB Part 2	Handout
1.2	Convergence *Cover Rate of Convergence, pages 20-22*	1(a)(b),2(a)(b),3,4
1.2	Convergence *Cover Order of Convergence, pages 23-27*	7,10,12,18
1.3	Floating Point Number Systems	1(c),2,4(a),(b),6(c),13,16
1.4	Mathematics on the Computer: Floating Point Arithmetic	1(c),2,7,9
2.1	The Bisection Method Part 1 *Introduction & Algorithm*	Write code
2.1	The Bisection Method Part 2 *Analysis*	1(c),4,6,11
2.3	Fixed Point Iteration Schemes *No Theorem Proofs; Order of Convergence;* *skip higher-order conv.*	5,6
2.4	Newton's Method Part 1 *Introduction & Algorithm*	Write code
2.4	Newton's Method Part 2 *Analysis*	1(a)(c),2,3,11
3.0	Linear Algebra Review	1,4,7,10,16
3.1	Gaussian Elimination	7,13,14
	REVIEW	
	TEST 1	
	Solutions to Exam 1	
3.2	Pivoting Strategies Part 1 *Partial pivoting*	1(c)(d),3,14
	Pivoting Strategies Part 2 *Scaled partial pivoting*	1(c)(d),3,14
3.3	Vector and Matrix Norms Part 1 *Vector Norms (up to page 174)*	1,2(b),3(a)(c)

Section(s)	**Title/*Note***	**Problems**
3.3	Vector and Matrix Norms Part 2 *Matrix Norms*	4,5(b)(d),6(a)(c)
3.4	Error Estimates and Condition Number Part 1 *Up to and including example 3.12*	1,2,7(a)(c)
3.4	Error Estimates and Condition Number Part 2	8(a)(c),11
3.5	LU Decomposition *Skip pages 200 and 201*	3,4(a)(b),14 (for $\mathbf{b}_1$, $\mathbf{b}_2$ only)
3.8	Iterative Techniques for Linear Systems Part 1 *Up to the middle of page 226*	
3.8	Iterative Techniques for Linear Systems Part 2 *Jacobi Method with pseudocode*	3(Jacobi only),5(a)(d),**Code**
3.8	Iterative Techniques for Linear Systems Part 3 *Gauss-Seidel Method with pseudocode*	3(GS only),7,**Code**
3.8	Iterative Techniques for Linear Systems Part 4 *SOR with pseudocode, Convergence Properties*	12(for Prob. 7 only),**Code**
	REVIEW	
	TEST 2	
	Solutions to Exam 2	
5.0	Overview of Interpolation	
5.1	Lagrange Form Part 1 *Linear and higher-degree polynomials*	2,4(a)(b),12
5.1	Lagrange Form Part 2 *Uniqueness and error of interpolation*	4(c)(d),7,9
5.3	Newton Form Part 1 *Divided Differences & Examples*	3,8
5.3	Newton Form Part 2 *Examples & Interpolation Error*	**Code**,13
5.4	Optimal Points for Interpolation Part 1 *Function norms & Chebyshev Polynomials*	1(a)(c)
5.4	Optimal Points for Interpolation Part 2 *Chebyshev Polynomials Cont'd*	3,6(a)(c) L^∞-norm only
5.4	Optimal Points for Interpolation Part 3 *Legendre Polynomials*	5,9
5.5	Piecewise Linear Interpolation	2,4,7
5.6	Cubic Spline Interpolation Part 1 *Interpolant and Not-a-Knot B.C.*	1,2
5.6	Cubic Spline Interpolation Part 2 *Clamped B.C. & Error Analysis*	10,11
	REVIEW	
	TEST 3	

Section(s)	**Title/*Note***	**Problems**
	Solutions to Exam 3	
5.8	Linear Regression	2,4,7
6.2	Numerical Differentiation Part II	6,8,10
6.3	Richardson Extrapolation	1,5,7
6.4	Newton-Cotes Quadrature Part I	
6.4	Newton-Cotes Quadrature Part II	1(c),2(c),6,9
6.6	Gaussian Quadrature	
6.7	Romberg Integration	
7.1	IVPs for ODEs	
7.2	Eulers method	
7.4	Runge-Kutta methods	
7.5	Multi-step methods	
	REVIEW FOR FINAL EXAM	
	REVIEW FOR FINAL EXAM	
	REVIEW FOR FINAL EXAM	