1 Handout

Mathematics 423, Spring Semester 1998
January 12, 1998

Instructor: Andrew Sommese
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Text: Numerical Analysis (sixth ed.), by Burden and Faires

Office Hours: Open Door: I am in my office almost all of every weekday, and encourage you to visit any time. If you just come to my office you will probably find me, but if you set up a time with me before hand, then you can be sure that I will be there.

Examinations, homework, and grades: There will be two one-hour departmental examinations worth 100 points and a two-hour final examination worth 150 points. The final exam will cover all the material of the course with emphasis on the material covered after the second exam.

A student who misses an examination will receive no points for that exam unless he or she has written permission from the *Vice President for Student Affairs*. (Travel plans are not considered to be a sufficient excuse for taking an exam on a different date.)

Homework will be assigned regularly, and is an integral part of the course. I ask students to form groups of three (and one or two groups of size four depending on the number of students in the class modulo 3) to do all the assignments. If there are people who would like to be in the same group, please let me know by the end of class on Friday, January 16. I will hand out the lists of members of the class by groups on Monday, January 19. If the class enrollment changes I might have to add members to a few groups. Typically I will give assignments throughout the week and collect them the following Monday. I strongly encourage you to see me if there is anything connected with the course or the mathematics in the course that you are unclear on or would like to know more about. You are allowed and encouraged to use your notes and C programs, any numerical analysis or C books, and any library books while doing the homework.

Both examinations and the homework are conducted under the honor code. People within a group are graded together on the homework assignments, and are expected to work together. People in different groups are encouraged to discuss the mathematics, but should not discuss how to do the week's assignment before it is handed in!

Homework will be worth 100 points. Thus the total number of possible points for the semester is 450. The numerical break points for letter grades (A, A-, B+,...) will be based only on the test scores and the homework.

Exam 1: Wednesday, February 25 in class
Exam 2: Wednesday, April 8 in class.
Final: Thursday, May 7, 1998: 8:00-10:00 AM.

The most recent version of this handout plus other useful materials can be found in `/afs/nd.edu/coursesp.98/math/math423.01`.

2 Homework Assigned

Due Date	*Page Number*	*Problems Assigned*
1st week	26	1a,c;3a,c;5e,h;6e,h;7e,h;8e,h;27
January 28 (Wed.)	53	1 (use a calculator); 7c,d; 13
extended to Feb. 2	63	1; 2; 12; 17
	75	1 (use a calculator); 6a,f; 8i:a,f; 13b,c
	86	4; 6
February 2 (Mon.)	119-123	1a,c; 2a,c; 3a,b; 5; 7a,b; 14; 16
February 9 (Mon.)	132-134	1; 2; 4; 13
	141-142	1a,c; 2a,c; 7
February 16 (Mon.)	197	1ab; 3ab; 5ab
	205–206	1a,b; 2a,b; 3ab; 7
	221–222	1a; 2a; 3ab; 7
	Exercise 1 of the Bernoulli polynomial handout	
February 23 (Mon.)	177-178	1 (forward diff. only); 3a,b
	186-187	9; 10; 11
	213	1h; 2h
March 2 (Mon.)	259	4
	267	1a
for Mar. 16 (Mon.)	Read to pg. 292	
March 18 (Wed.)	258	1c,d;
	267	1c; 2c; 3b,c; 4c
	274	1a,d; 2a; 3b
March 23 (Mon.)	285	11a; 15–use maple
	293	6 (use rkf45; maple makes this easy)
	304	1a; 2a; (only two-step methods, only $t \leq 0.4$)
March 30 (Mon.)	328	2
(write as a system of first order equations, do not solve)		
	340	4b,c
	483-485	5acd(use logs in d); 7; 10
	496	11; 12a
	506	1a
April 6 (Mon.)	597	2, 4, 5a, 9a
	604	1d, 3a; Also do the Problems 1, 2 below.
April 20 (Mon.)	631	3b
	638	3a,c
	644	3a,d
	547	3

April 27 (Mon.)	651	3c,d
	154	1; 3a,d; 11

Problem 1. Let V_4 denote the degree ≤ 4 polynomials. Compute the degree ≤ 4 polynomial $p(x)$ such that $||p(x) - T_6(x)|| = \min_{q \in V_4} ||q(x) - T_6(x)||$. where $T_6(x)$ is the sixth Chebychev polynomial and $||f|| = \sqrt{< f, f >}$, where for two functions f, g on $[-1, 1]$

$$< f, g >= \int_{-1}^{1} \frac{f(x)g(x)}{\sqrt{1-x^2}} \mathrm{d}x.$$

Problem 2. Let V_3 denote the degree ≤ 3 polynomials. For two functions f, g on $[0, 1]$ let

$$< f, g >= \int_{0}^{1} f(x)g(x) \mathrm{d}x.$$

Find a basis of V_3 that contains 1 and is orthogonal relative to $< f, g >$.