## Ma 403  Intermediate Analysis

**Instructor:**  David Brown

      Office:   Al 19

                Office Hours:  MWF Al 314; 2:00 pm: T AL 314; 1:30 PM

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**Course Description:**  The real and complex number system, point-set theory, concepts of limit and continuity, differentiation of functions of one and more variables, functions of bounded variation, rectifiable curves, and connected sets.   Three hours.  Prerequisite: Ma 302

**Course Readings:**   Introductory Functional Analysis by Kreysig.

### Course Goals

1. To develop a Christian perspective of Calculus and related scientific endeavor
2. To develop mathematical maturity and independent thinking
3. To develop a greater appreciation for the beauty and power of abstract reasoning
4. To develop a greater interest in exploring mathematical ideas independent of the teacher

### Course Objectives

1. Develop Christlike qualities such as perseverance, diligence, and dependence on God. (This course will be a stretch for some.  It may be the first course will theory is applied in a heavy way.  Dependence on God may be very necessary for some.  Math majors are usually very self confident, but remember that it is good to have to trust God.  I hope for some this course will help in this area)
2. Develop the ability to apply the content and methods of proof to a new area of mathematics. (This will be a course where we generalize several topics of Calculus to new areas.  The ability to generalize and think abstractly will be emphasized in this course)

### Course Content   The meat of the course shall come from chapters 1 and 2 and chapter 3.1 through 3.6.  Additional topics taken from  chapter 5.1 through 5.3, handouts, and as time permits additional topics from the remaining sections of chapter 3. An approximate sequence will be

 Chapter 1 sections 1 – 2 Quiz

 Chapter 1 sections 3 – 4 Quiz

 Chapter 5 sections 1 and 3 No Quiz

 Chapter 1 sections 5 – 6 Quiz

 Chapter 2 Sections 1 – 3 Quiz

 Chapter 2 Sections 4 – 5 Quiz

 Chapter 2 Sections 6 – 7 Quiz

 Handout and Section 5.2 No Quiz

 Chapter 2 Sections 8 – 10 Quiz

 Chapter 3 Sections 1 – 4 Quiz

 Chapter 3 Sections 5 – 7 + additional material: Quiz

 Topics from Rest of Chapter 3 as time permits

 Cumulative Final

## Proposed Lecture Schedule: The following schedule is only tentative and is subject to change.

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Monday** | **Wednesday** | **Friday** |
| 0 |   | 1.1 | 1.2 |
| 1 | Review | Quiz 1.1-1.2 | Applications to Hamming Distance |
| 2 | 1.3 | 1.4 | Review |
| 3 | Quiz 1.3-1.4 | 5.1 | 5.3 |
| 4 | 1.5 | 1.6 | Review |
| 5 | Test Chap. 1 | 2.1 | 2..2 |
| 6 | 2.3 | 2.4 | 2.5 |
| 7 | Review | Quest 2.1-2.5 | 2.6 |
| 8 | 2.7 | 2.8 | 2.10 |
| 9 | 2.6 | 2.7 | 2.9 |
| 10 | 2.10 | Review | Quest 2.6-2.10 |
| 11 | 3.1 | 3.2 | Review |
| 12 | Quiz 3.1-3.2 | Thanksgiving | Thanksgiving |
| 13 | Thanksgiving | 3.3 | 3.4 |
| 14 | 3.5 | 3.6 | 3.7 |

**Course Grading:**

**Homework:** Homework will constitute an integral part of this course.  The problems assigned will require independent thinking and for many of you this will be the first course where you are required to prove a theorem for the first time( that is, you will have to develop the proof).  Reading and understanding similar proofs from the lecture will be invaluable.  For example, we will do several proofs of the type "this is a metric space" in class.  You will then have to do a similar proof in the homework.  Homework counts 40% of the grade.  The problems in bold are assigned. The problems in italics are extra credit, and the others we will do together in class if we have time or you can work together outside of class to do them. They also will be given minimal extra credit. They are due the day before the quiz and at the beginning of the class hour. We will as a group then review the homework as we have time on the day before the quiz.

* Homework must be your own work, but after submitting it, we will work together to make sure we understand it. You will want to know how to do the problems before the quiz.
* Make sure your proofs in particular are complete. Over explain a problem or proof rather than under explain. You are trying to CONVINCE me that you know what you are doing.
* Homework must be neat and well organized. You should use proper notation and complete sentences. Yes and no answers by themselves are never appropriate. In the past, some students only wrote the answers found in the back of the book. They didn't get any credit.

**Quizzes and Tests and Final Exam:** We will have several major quizzes in class.  Quizzes count 40% of the grade.  The Final will be cumulative and will count 10% of the grade.  Class participation and effort counts the final 10 % of the grade.

**Attendance:**  Attendance is required and absences will be recorded.  Any planned absence should be communicated to the instructor a week in advance (an email will suffice).  Any tests or quizzes given during planned absences should be taken before you leave.  For any absences due to emergencies or sickness, the student will have one week from returning to class to make up any quizzes or tests.  A 10% penalty on any quizzes or tests will be assessed for an unexcused absence.

### Grading Scale

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Percent** | **Grade** |   | **Percent** | **Grade** |
| 93-  | A  | 77-79 | C+ |
| 90-92 | A- | 73-76 | C  |
| 87-89 | B+ | 70-72 | C- |
| 82-86 | B  | 62-69 | D  |
| 80-82 | B- | 60-62 | D- |

### Late Work: Permission to miss must be obtained beforehand. All work must be made up before missing unless arrangements are made beforehand. In case of sickness or emergency absence, email me as soon as you know you will miss.

### Cheating

Cheating is defined as any use of unauthorized helps. In today's age of technology, this includes getting unapproved help from a source on the internet and/or using your calculator to store formulas or information that you are to know from memory. If you have a question about any source you are considering using, please gain teacher approval before using it. The presence of any material on your desk containing formulas, notes, etc. (except for those allowed by the instructor) while taking a test, will be construed as cheating and will be dealt with as such. Cheating on a test will result in a zero on the test plus any penalties imposed by the discipline committee. You may not work together on take-home questions. You may work together on your homework.

Since the goal of the assignments in this course is to learn to develop the skills covered NOT complete the tasks assigned, and since the use of AI to complete or jumpstart tasks defeats the goal of the assignments, you may not use generative AI tools (i.e. Chat GPT, Bing Chat, Google Bard, etc.) in this course for any assignment without the professors express permission.  Should an AI tool be used with permission, its use must be documented.

### Homework

The homework assigned for the material covered by a test will be handed in at the beginning of the period on the day you are tested over the material. Be sure to adhere to the following:

* Homework must be handed in on 8½ by 11 inch paper in a notebook or folder.
* Homework must be your own work, but you are encouraged to work together to figure out how to do it. It is to be a learning experience.
* Homework must be neat and well organized. You should use proper notation and complete sentences. Yes and no answers by themselves are never appropriate. In the past, some students only wrote the answers found in the back of the book. They didn't get any credit.

### Tentative Homework Assignments:  For any question in which the answer is  provided in the back of the book, the work must be shown.

Page 8:  2, 5(show work),  8, 10, 14

Page 16: 1, 6,  8(hint see problem 9), 11, 12, 15

Page 23:  1, 2, 3, 6, 8, 9, 14

Page 31  1, 2, 4, 6, 8, 9

Page 39  1, 2, 4, 8, 10

Page 45  1, 2, 6, 9,10, 12

Page 63  2, 8, 12, 14

Page 70  1, 2, 5, 6, 8, 10, 15

Page 76  1, 2, 4, 5, 8,

Page 81  1, 2, 5

Page 90       2, 3, 4, 6, 14

Page 101     5, 7, 9

Page 109     2, 5,

Page 116     1, 2, 3, 4, 5, 6

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