



**MTH 445 Real Analysis**  
**Semester 082 (Sem II - Winter 2009)**  
**Course Syllabus**

**Instructor:** Karen E. Donnelly. Office: 257 Core Building  
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**Home page URL:** www.saintjoe.edu/~karend

**Office Hours**

Monday 2:00 p.m. -- 3:00 p.m.

Tuesday 10:00 a.m. -- 11:00 a.m.;

2:00 p.m. – 3:00 p.m.

Wednesday 2:00 p.m. – 3:00 p.m.

Thursday 10:00 a.m. -- 11:00 a.m.;

2:00 p.m. – 3:00 p.m.

Friday: 9:00 a.m. – 10:00 a.m.

*Contact for appointment during other times.*

**Real Analysis Web Page URL:** www.saintjoe.edu/~karend/m445

**Text:** Steven R. Lay: *Analysis with an Introduction to Proof*, 4th Ed., Prentice Hall. ISBN: 0-13-148101-0

**Course Objectives:**

1. To investigate the fundamental concepts of analysis for real functions of a single variable, including:
  - a. properties of real numbers
  - b. sequences and series
  - c. continuity and limits
  - d. differentiation
  - e. integration
2. To develop the student's appreciation of methods of proof and ability to develop and present rigorous mathematical arguments.

**Course Outline:**

1. **Fundamentals of Logic, Sets, Proof (Parts of Chapter 1 and 2 as needed)**
2. **Development of the real numbers: (Chapter 3)**
  - a) Cardinality
  - b) Natural numbers and induction
  - c) Real Numbers
3. **Sequences of Real Numbers (Chapter 4)**
  - a) Convergent sequences
  - b) Monotone sequences, subsequences
4. **Continuity and Limits (Chapter 5)**
  - a) Properties of continuous functions
  - b) Extreme Value Theorem and Intermediate Value Theorem
  - c) Uniform continuity concepts
  - d) Limits
5. **Differentiation (Chapter 6)**
  - a) Properties of derivatives
  - b) Mean-value theorems
  - c) L'Hospital's Rule
  - d) Taylor's Theorem
6. **Integration (Chapter 7)**
  - a) Definition of the integral and integrability with the Riemann Integral
  - b) The Fundamental Theorem of Calculus
7. **Infinite Series (Parts of Chapters 8 and 9)**
  - a) Convergence of sequences and series of functions

**Tentative Test Schedule**

First Test: Tues. Feb. 3rd

Second Test: Thurs. March 12<sup>th</sup>

Third Test: Tues., April 7th

Fourth Test : Submit Wed.,  
 Apr.29<sup>th</sup> 4:00 p.m.

### Grade Distribution:

Assignments, Quizzes:	35%
Four Tests:	45%
Maple Project / Presentation:	15%
Attendance and Participation:	05%

### Grading Scale:

93%-100%	A	90%-92%	A-		
87%-89%	B+	83%-86%	B	80%-82%	B-
77%-79%	C +	73%-76%	C	70%-72%	C-
67%-69%	D+	60%-66%	D		
59% or Below	F				

### Expectations and Requirements:

*Special Note:* If you are a student with a disability, please meet with me immediately to discuss the accommodations you will need during class activity, examinations, and out of class assignments in order to participate fully and demonstrate your abilities.

**1. Academic Honesty:** Plagiarism or other forms of academic dishonesty on any assignments, tests, or quizzes will not be tolerated. If the instructor finds that a student has engaged in dishonesty, the student may be referred to the Dean of Academic Affairs for appropriate action.

**2. Quizzes and Exams:** Students are expected to be present for all exams. **No exams or quizzes may be made up** unless the student has contacted the instructor and received permission **prior** to the date of the original exam or quiz. This includes students participating in athletics who must arrange to take the quiz or exam **on or before the scheduled date**.

**3. Assignments:** Assignments, unless otherwise specified by the instructor, are to be **completed individually**. While students are encouraged to **consult** each other for ideas for assignments, the solutions should be completed individually. Any help one student gives another should be instructional help only. If the instructor feels that a student has not completed an assignment individually, the instructor may question the student on that assignment. The student should be able to explain how he/she worked the problem and should be able to work similar problems. **Late assignments will not be accepted without permission.** If permission is given, the following penalties may be assigned:

**1 day late: 10% reduction; 2 days late: 20% reduction; 3 days late: 30% reduction**  
**Not accepted after 3 days late.**

### Homework Guidelines:

- Write out complete answers NEATLY and CLEARLY.
- Number each exercise to the left.
- Problems should proceed in numerical order from top to bottom.
- You must show your work! Correct mathematical notation must be used. Partial credit is given when work is shown even if answer is incorrect. However, correct answers without any work shown will in general be given no credit.
- If the problem is a computation leading to a final answer, box the answer.
- **Use pencil and eraser** -- do not scratch out work.
- **Staple** your pages together before submitting.

Start homework early and see me for help with problems you don't know how to work! *It is inappropriate to ask how to do a problem in class the day it is due!!!!* My office is Core 257-- See my schedule for office hours or call or send email for an appointment. I am always delighted to help.

### 4. Class Preparation and Participation:

a) **Keep up with reading assignments.** To receive the maximum grade on attendance and participation the student must read assignments **prior** to class, be prepared to ask and respond to questions, and be an actively engaged participant in class.

b) Take good notes and **review notes** on a regular basis as well as promptly begin and continue work on assignments as they are assigned.

c) **Attendance is required.** If you must miss class due to illness or other valid excuse (e.g. athletic event) please send me email or telephone with an explanation prior to the class date.

d) **Electronic Equipment in class.** No devices with headphones may be used in class. All cell phones must be turned off during class. No laptops may be used in class unless permission is given by instructor.

### 5. Getting Help:

- Students who do not understand a concept should do the following:
- a) Ask questions in class. (More than likely other students do not understand as well.)
  - b) Seek individual help from the instructor. I am more than willing to give you the extra help you may need. Come in during office hours or make an appointment. Tutoring (free) can also be arranged either through me or through counseling services.
  - c) Share with me any concerns you may have or any suggestions you have for the class structure that will help you learn more effectively.

*The above content and requirements are tentative and subject to change according to time constraints and other factors as determined by the instructor.*

**MTH 445 Real Analysis Tentative Exercise List Semester 082 (Winter 2009)**

<b>Exercise Set 1</b>	page 8: 1.4 all (use tautologies from practice 1.6 for c-g), 1.6, 1.10 all, 1.12 page 14 2.4, 2.8, 2.10
<b>Exercise Set 2</b>	pages 24-26: 3.3, 3.4, 3.5, 3.6 a e h
<b>Exercise Set 3</b>	page 32: 4.4, 4.8, 4.14, 4.16
<b>Exercise Set 4</b>	page 46: 5.6, 5.10, 5.14, 5.15, 5.16, 5.17 Also, prove Theorem 5.13 g
<b>Exercise Set 5</b>	page 103: 10.1, 10.2, 10.6, 10.9
<b>Exercise Set 6</b>	page 127: 12.1, 12.2, 12.3, 12.4
<b>Exercise Set 7</b>	page 134: 13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.9
<b>Exercise Set 8</b>	page 143: 14.1, 14.2, 14.3
<b>Exercise Set 9</b>	page 162: 16.1, 16.2, 16.6 c and d, 16.7 b, 16.8 a and b
<b>Exercise Set 10</b>	page 172: 17.3, 17.5 b, d, f and h, 17.6
<b>Exercise Set 11</b>	page 179: 18.1, 18.2, 18.3 c, 18.4
<b>Exercise Set 12</b>	page 187: 19.1, 19.2, 19.4, 19.14
<b>Exercise Set 13</b>	page 197: 20.3 a,d,h, 20.4, 20.6 c, 20.9 a,b,c
<b>Exercise Set 14</b>	page 207: 21.3, 21.4
<b>Exercise Set 15</b>	page 214: 22.1, 22.2, 22.5
<b>Exercise Set 16</b>	page 221: 23.1, 23.3 b, c, d, e, f
<b>Exercise Set 17</b>	page 239: 25.1, 25.2, 25.4a, b
<b>Exercise Set 18</b>	page 248: 26.1, 26.2, 26.3, 26.5a, d, f
<b>Exercise Set 19</b>	page 283: 30.1, 30.2, 30.3 a, 30.11
<b>Exercise Set 20</b>	page 291: 31.1, 31.3, 31.5