MTH424 (4 units)
Real Analysis
MWF 8:30-9:35 AM RS 14

Instructor: Greg Crow, Ph.D.
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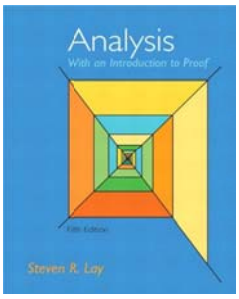
Office Hours: Posted in Canvas

Text Book:



Analysis: With an Introduction to Proof, 5th Edition, by Steven R. Lay

Calculator: A scientific calculator is recommended

University Mission:
Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Department Mission:
The Mathematical, Information, and Computer Sciences department at Point Loma Nazarene University is committed to maintaining a curriculum that provides its students with the tools to be productive, the passion to continue learning, and Christian perspectives to provide a basis for making sound value judgments.

Catalog Description:
MTH 424 (4 Units) Real Analysis
Real numbers, topology of Euclidean n-space, continuity, differentiation and integration theory.
Corequisite(s): MTH 233 and MTH 242 and Junior standing.

Learning Outcomes
- Students will be able to demonstrate facility with analytical concepts.
- Students will be able to write proofs.
- Students will be able to speak about their work with precision, clarity and organization.
- Students will be able to write about their work with precision, clarity and organization.
- Students will collaborate effectively in teams.
- Students will be able to understand and create arguments supported by quantitative evidence, and they can clearly communicate those arguments in a variety of formats.

Course Approach
Mathematics is learned primarily by doing Mathematics–not simply listening to it; that is, the effective learning of mathematics is an active process, involving participation. Thus, the course aims to maximize student involvement, hence student achievement.

Individual concepts in mathematics are learned (mastered as opposed to memorized) by thinking and working through numerous examples and exercises which involve these concepts; by this process mathematical concepts become familiar, and less abstract.

The instructor is responsible for overall planning, for directing instructional activities, and for evaluation of student achievement.

You are ultimately responsible for your own achievement. For example, you are responsible for meeting all scheduled activities of the course, such as class meetings, problem assignments, exams, and the final examination; you are also responsible for regular work outside of class in preparation for class lectures and discussions.

Proofs
The best way to learn to write proofs is to practice writing them. You had a brief introduction to proof writing in MTH242. In this class you will reinforce those skills as you learn new mathematics. You will be most successful in this course if you participate in all of the in-class proof writing activities, if you stay current with your homework and if you re-write proofs that have been returned to you containing errors (either on homework or exams).

Homework:
The homework is designed to allow you to grasp the concepts of Real Analysis; it is not an end in itself. Assignments will be announced on Monday, Wednesday and Friday. The work will be due on the following Friday. The problems from the text must be submitted as a hard copy. There may also be other activities that are completed as homework. Late homework will not be accepted without prior consent or a well-documented emergency beyond your control. The lowest homework score will be dropped prior to computing the final course grade.

Collected assignments must be prepared in a style suitable for grading. The following guidelines are used to determine credit:

- the organization must be easy to follow
- the work must be legible
- complete solutions must be written for problems (not just answers);
- answers must be clearly marked
- use complete sentences to answer questions

Examinations and the Final Examination:
There will be one Mid-Semester Examinations and a comprehensive Final Examination. The Mid-Semester Examination and the Final Examination will include problems and questions over material assigned in the text, readings and handouts, as well as material presented in class. The examination schedule is included in the daily schedule. The instructor will not accept excuses such as poor communication with parents, benefactors, surf team sponsors and/or travel agents. No examination shall be missed without prior consent or a well-documented emergency beyond your control. In such cases, all make-up exams will occur at 8:30 am on the Saturday between classes and Final Exam week. A score of zero will be assigned for an examination that is missed without prior consent or a well-documented emergency beyond your control.

Grade Components:

Grade Component	Percent
Mid-Term Examination	25
Final Exam	35
Proof of the Week	20
Written Homework	20
Total	100

Grading Scale:
Grades are based on the number of points accumulated throughout the course with the following exception. A student must pass at least one of the Mid-Term Examination or the Final Examination in order to pass the class. That is, a score of 60% must be achieved on one of these two Examinations, or else the final grade will be an F regardless of all other point totals. Approximate minimal percentages required to obtain a given grade are:

Grading Scale in percentages	A	B	C	D
+		(87.5, 90.0)	(77.5, 80.0)	(67.5, 70.0)
	[92.5, 100]	[82.5, 87.5]	[72.5, 77.5]	[62.5, 67.5]
-	[90.0, 92.5)	[80.0, 82.5)	[70.0, 72.5)	[60.0, 62.5)

Attendance:
Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day.

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Class_Attendance in the Undergraduate Academic Catalog.

If you miss 10% of the class, you will receive a warning. If you miss 20% of the class, you will be automatically de-enrolled.

Class Enrollment:
It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

Academic Accommodations:
If you have a diagnosed disability, please contact PLNU's Disability Resource Center (DRC) within the first two weeks of class to demonstrate need and to register for accommodation by phone at 619-849-2486 or by e-mail at DRC@pointloma.edu. See Disability Resource Center for additional information. For more details see the PLNU catalog:
http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic_Accommodations

Students with learning disabilities who may need accommodations should discuss options with the instructor during the first two weeks of class.

Academic Honesty:
Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic_Honesty for definitions of kinds of academic dishonesty and for further policy information.

Copyright Protected Materials:
Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

Credit Hour:
In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 4 unit class delivered over 15 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

Final Exam: 7:30 -10:00 am on Wednesday December 13th, 2017
The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in the course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

The Final Exam is a Comprehensive Examination.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
August	20	21	22	23	24	25	26
	27	28 Student Transitions	29 1.1 & 1.2 Connectives Quantifiers	30 Section 1.3 Techniques of Proof: I	31	1 Section 2.1 Basic Set Operations	2
September	3	4 **Labor Day** (No Classes)	5	6 Section 1.4 Techniques of Proof: II	7	8 Section 2.2 Relations	9
	10	11 Section 2.3 Functions	12	13 Section 2.4 Cardinality	14	15 Section 2.4 Cardinality	16
	17	18 Section 3.1 Natural Numbers and Induction **Department/School Chapels**	19	20 Proof Writing Workshop	21	22 Section 3.2 Ordered Fields	23
	24	25 Section 3.3 The Completeness Axiom **Spiritual**	26 ———————	27 Section 3.3 The Completeness Axiom **Renewal**	28 ———————	29 Section 3.4 Topology of the Real Numbers **Week**	30
October	1	2 Section 3.4 Topology of the Real Numbers	3	4 Section 3.5 Compact Sets	5	6 Section 3.5 Compact Sets	7
	8	9 Proof Writing Workshop	10	11 Section 4.1 Convergence	12	13 Section 4.2 Limit Theorems	14
	15	16 Review	17	18 **Exam 1**	19	20 Fall Break (No Classes)	21
	22	23Section 4.3 Monotone Sequences and Cauchy Sequences	24	25 Section 5.1 Limits of Functions	26	27 Section 5.2 Continuous Functions	28
	29	30 Section 5.3 Properties of Continuous Functions	31	1 Section 5.4 Uniform Continuity	2	3 Section 6.1 The Derivative	4
November	5	6 Section 6.2 The Mean Value Theorem	7	8 Section 6.3 L'Hospital's Rule	9	10 Section 6.4 Taylor's Theorem	11
	12	13 Section 7.1 The Riemann Integral	14	15 Section 7.2 Properties of the Riemann Integral	16	17 Section 7.3 The Fundamental Theorem of Calculus	18 Homecoming
	19	20 Section 8.1 Convergence on Infinite Series	21	22 Thanksgiving Recess	23 **Thanksgiving Day**	24 Thanksgiving Recess	25
	26	27 Section 8.2 Convergence Tests	28	29 Section 8.3 Power Series	30	1 Section 9.1 Pointwise and Uniform Convergence	2
December	3	4 Section 9.2 Applications of Uniform Convergence	5	6 Section 9.3 Uniform Convergence of Power Series	7	8 Review	9
	10	11	12	13 **Final Exam** **7:30-10:00 AM**	14	15	16