

Math 312

Concepts of Real Analysis

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Course Information

Course time

Monday, Wednesday, Friday: 12:20–1:10 p.m.

Course location

OBS 121

Office hours

Monday, Wednesday, Friday: 1:30–2:30 p.m.

Tuesday: 12:30–1:30 p.m.

Office location

Benson 87

This course is housed in the Department of Mathematics, School of Science, Penn State Behrend.

Textbooks

We will utilize instructor notes throughout this course.

Course Format

As Paul Halmos noted, “The only way to learn mathematics is to do mathematics.” Hence, we will spend the majority of our in-person class time doing mathematics. In particular, there will be a balance between lectures and class exercises, which sometimes take the form of quizzes or worksheets. In addition, there will be weekly homework assignments designed to help you develop a mastery of the material. Finally, there will be three exams and a comprehensive final exam to assess your understanding of the material.

Learning Outcomes

Upon successful completion of the course, students will be able to:

- Describe the real line as a complete ordered field.
- Use the definitions of convergence as they apply to sequences, series, and functions.
- Determine the continuity, differentiability, and integrability of functions defined on subsets of the real line.
- Apply the Mean Value Theorem and the Fundamental Theorem of Calculus to problems in the context of real analysis.
- Write solutions to problems and proofs of theorems that meet rigorous standards based on content, organization and coherence, argument and support, and style and mechanics.
- Recognize the difference between pointwise and uniform convergence of a sequence of functions.
- Illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability.

Grading Policy

Your final grade is broken up as follows.

Category	Percentage
Homework	10%
Worksheets	10%
Quizzes	10%
Exams (15% each)	45%
Final exam	25%

Your final letter grade is based on the following scale.

Grade	Percentage interval
A	93–100%
A-	90–less than 93%
B+	87–less than 90%
B	83–less than 87%
B-	80–less than 83%
C+	77–less than 80%
C	70–less than 77%
D	60–less than 70%
F	0–less than 60%

Assignment Descriptions

Homework

To help develop a mastery of the material, students will be given several homework assignments that cover the material in greater depth. Students are expected to write out their answers with an appropriate amount of work shown. If a student has an excused absence, they will be given additional time to complete the assignment. However, the student must communicate with the instructor prior to the assignment deadline.

Worksheets

Worksheets are given to complement the lecture material. Some worksheets will be completed in class; others will be completed at home and turned in during the following class period. Students who are absent from class are expected to complete the worksheets on their own and turn them in during the following class period.

Quizzes

Quizzes are given weekly throughout the semester to assess your understanding of the material and to help you prepare for the exams. These quizzes will be administered in class; only those with an excused absence will be given additional time to complete the quiz. Again, the student must communicate with the instructor prior to the quiz date.

Exams

We will have three exams throughout the semester. These exams are intended to test your general understanding of the concepts covered up to that point, with a heavy emphasis on the main definitions, theorems, and problem-solving methods. These exams will be administered in class; only those with an excused absence will be given additional time to complete the exam. Again, the student must communicate with the instructor prior to the exam date.

Final Exam

A comprehensive final exam will be given during finals week. The final is administered in person; only those with an excused absence will be given additional time to complete the exam. Again, the student must communicate with the instructor prior to the exam date.

Attendance Policy

Class attendance is highly encouraged and partially monitored through worksheets and quizzes. In the case of an excused absence, such as illness, athletic contests, or job interviews, students will be given a reasonable amount of time to make up an exam or assignment. However, they are responsible for notifying the instructor prior to the absence. In the event of a long-term absence, we recommend that the student contact Student Affairs about the possibility of a withdrawal for the semester.

Academic Integrity

Academic integrity is a basic guiding principle for all academic activity at the University, and all members of the community are expected to adhere to this principle. Specifically, academic integrity is the pursuit of scholarly

activity in an open, honest, and responsible manner. It includes a commitment not to engage in or tolerate acts of falsification, misrepresentation, or deception. Such acts violate the fundamental ethical principles of the University community and undermine the efforts of others.

Violations of academic integrity are not tolerated at Penn State Behrend. Violators will receive academic sanctions and may receive disciplinary sanctions, including the awarding of an XF grade. In cases such as these, an XF grade is recorded on the transcript and states that failure of the course was due to an act of academic dishonesty. All acts of academic dishonesty are recorded so that repeat offenders can be sanctioned accordingly. For more information, visit [Academic Integrity for Students](#).

AI Policy

The use of AI tools, such as ChatGPT, is strictly prohibited for any graded work in this course. This includes, but is not limited to, homework assignments, worksheets, quizzes, exams, and the final exam. Any use of AI tools for graded work will be considered a violation of academic integrity and will be subject to disciplinary action, including but not limited to receiving a failing grade for the assignment or exam, and potentially failing the course. Students are expected to complete all graded work independently and without the assistance of AI tools. If you have any questions about what constitutes acceptable use of AI tools in this course, please consult with the instructor.

Disabilities and Learning Differences

Penn State is firmly committed to providing full access to its programs and services for all individuals. The University encourages academically qualified students with disabilities to take advantage of the educational programs and accommodations offered at Penn State Behrend.

For more information, visit [Students with Disabilities and Learning Differences](#).

Educational Equity Concerns

Penn State takes great pride in fostering a diverse and inclusive environment for students, faculty, and staff. Acts of intolerance, discrimination, harassment, and/or incivility due to age, ancestry, color, disability, gender, national origin, race, religious belief, sexual orientation, or veteran status are not tolerated and can be reported through Educational Equity at the [Report Bias site](#).

Counseling and Psychological Services

Students with academic concerns related to this course should contact the instructor in person or via email. Students may also occasionally have personal issues that arise in the course of pursuing higher education that may interfere with their academic performance. If you find yourself facing problems affecting your coursework, you are encouraged to talk with an instructor and to seek confidential assistance at Penn State Behrend Personal Counseling Services at [814-898-6504](tel:814-898-6504).

For more information, visit [Personal Counseling Services](#).

Copyright of Class Materials

You may not share any information from this course (including notes and assignments) with others who are not currently registered for the course, nor post such information electronically without the permission of the instructor—this includes online note-taking and note-sharing services (see Penn State Administrative Policy AD-40). Also prohibited in the policy is posting audio, video, or photographs to social media sites or other publicly accessible resources. Unless you have my permission, you risk disciplinary sanctions.

Title IX

Penn State is committed to fostering an environment free from sexual or gender-based harassment or misconduct. The Office of Sexual Misconduct Prevention and Response ensures compliance with Title IX, a federal law that prohibits discrimination based on the sex or gender of employees and students. Behaviors including sexual harassment, sexual misconduct, dating violence, domestic violence, and stalking, as well as retaliation

for reporting any of these acts, violate Title IX and are not tolerated. The University is also committed to providing support to those who may have been impacted by incidents of sexual or gender-based harassment or misconduct and may provide various resources and support services to individuals who have experienced one of these incidents.

For more information, visit the [Title IX information page](#) or the [Title IX resources for Penn State Behrend](#).

Center for Learning Excellence

The Center for Learning Excellence offers tutoring services that can help you find gaps in your understanding of concepts, show you how to get the most out of your textbook, give you advice about how to prepare for a test, and study for the course. Free peer tutoring appointments, in person and online, can be made through [Tutor Trac](#).

For information about study abroad, scholarships and fellowships, the GRE, writing personal statements, and study skills, visit the [Learning Resource Center](#), email BDtutor@psu.edu, or call [814-898-6140](tel:814-898-6140) from 8:00 a.m. to 5:00 p.m., Monday through Friday.

Career Services

Penn State Behrend Career Services prepares Penn State students to enter the workforce or graduate school through a variety of services. Career professionals will assist with resume and cover letter reviews, internship and job searches, interview preparation and mock interviews, career fair preparation, development of career competencies, and graduate school preparation. You can stop by the Career Services office in Reed 125 during drop-in hours Monday–Friday, 12:00–4:00 p.m. You may also schedule an appointment through Starfish or call [814-898-6164](tel:814-898-6164). For more information, visit [Penn State Behrend Career Services](#).

Important Dates

Event	Date or deadline
Classes begin	August 24
Regular drop deadline	11:59 p.m., August 29
Regular add deadline	11:59 p.m., August 30
Labor Day	September 7
Exam 1	September 21
Final exam conflict filing period	September 28–October 25
Exam 2	October 26
Late add/drop deadline	November 13
Thanksgiving break	November 22–28
Exam 3	December 2
Classes end	December 11
Final exams	December 14–18

Disclaimer

I reserve the right to diverge from this syllabus in the best interest of my students' learning and achievement. Any changes made will be announced in advance.