Welcome to MTH 451! In this syllabus you will find basic information you need to navigate the course, a description of what we will be studying this semester, and advice intended to help you succeed in the course and make the class time enjoyable and productive. Please read this document carefully and save it as a reference. Don’t worry if some of the mathematical terminology is new to you, we will be defining all new concepts as we go.
1 Basic Information

Instructor Information
Instructor    David Offner
Email         offnerde@westminster.edu
Office Phone  724-946-7293
Office Hours  MWF 10:30–11:30 in Hoyt 156 or by appointment—just send email!

Course Information
Time and Location MWF 12:50-1:50, Hoyt 152
Textbook        Real Analysis and Applications, Frank Morgan
Prerequisite    C- or better in MTH 361

Assignments: There will be short weekly quizzes and graded homework where you will hand in carefully written solutions to selected problems. Late assignments will not be accepted. Discussion of the assignments with anyone and everyone is encouraged, but all submitted work must be written independently. In particular, you are not permitted to see the actual pages that another student is submitting. You will typically be expected to read a section of the textbook before every class, and submit a reading response on the course website. We will have a midterm exam Friday, October 20, and a final exam on Tuesday, December 12, from 8 am to 10:30 am. Do not make plans to leave campus before this time as this will be the only time available to take the final exam.

Grades: Your grade will be based on homework, quizzes, reading responses, the midterm, and a cumulative final exam. It will be calculated using the following formula:

Quizzes 35%
Graded homework 10%
Reading responses 5%
Midterm 20%
Final 30%

Academic integrity: Academic dishonesty will not be tolerated. The penalty for academic dishonesty is minimally the grade of 0 on the assignment and a grade of F for the course. Any event of academic dishonesty is reported to the Dean of the college. Details of violations and consequences are given in the Catalog, beginning on page 65.

Accessibility Statement: Westminster College actively strives for the full inclusion of all our students. Students with disabilities who require access solutions for environmental or curricular barriers should contact Faith Craig, Director of Disability Resources, located in 209 Thompson-Clark Hall. You may reach her at 724-946-7192 or craigfa@westminster.edu. No accommodations can be given without documentation from the Office of Disability Resources.

Texting and other distractions: Texting, checking your email, reading material
unrelated to the course, and participating in other diversions from class are considered disrespectful to the instructor and your classmates. Please turn off all electronic devices during class.

2 Description of the course

Goals of the course: At the end of the 17th century, mathematics and science took a great leap forward with the discovery of calculus. Calculus allowed scientists to understand and describe many scientific phenomena, particularly in physics. But as the theory was developed further, mathematicians found that they could not rigorously justify all of the ideas in calculus, even as they worked miraculously in real world applications. In particular, there came a great crisis starting in 1807 spurred by the work of Joseph Fourier, who was using infinite sums of trigonometric functions to describe heat transfer. It took a couple more generations after Fourier and the work of many great mathematicians to finally put the concepts of calculus, Fourier series, and associated ideas on sound axiomatic footing. This is the story of analysis, and what you will work to understand this semester.

Specific course objectives: By the end of the semester, you should be able to

- Rigorously define the structure of the real numbers and the concepts of calculus.
- Prove important theorems in calculus and analysis and understand the connections between them.
- Apply theorems of analysis to selected real world problems.

Course description from the course catalog: A study of the analytic properties of real functions and sequences. Topics include set theory, the real number system, limits, continuous functions, differentiation, Riemann integration, sequences, and series.

3 Some advice on studying mathematics

1. Ask questions! Chances are, if you have a question, so do many other people in the class, and they will be grateful if you ask. The instructor will be grateful as well! Discuss questions with your friends and come to office hours. *If you don’t speak up for yourself, who will?*

2. Take notes in class. If it’s written on the board, it’s worth writing in your notes. Lectures generally proceed at such a pace that you will not grasp every detail upon first hearing it. If you have good notes, you will be able to go back through the lecture and understand all of the concepts and details you may have missed or not understood the first time through.
3. Review your notes. Even if you think you understood everything from lecture, you will frequently find points you have missed or make connections between concepts on a second reading. Also, some professors can be so convincing in lecture that they make difficult concepts seem easy. Reading over your notes after lecture is a good way to make sure you really understood what was being presented. Some students use a technique of copying over their notes after class, writing each step only when they can explain why it’s true.

4. Keep up with the reading and coursework. Mathematical concepts can take some time to understand, and you will need to think about them (and sleep on them) a few times before you really get it. DO NOT put off your work and try to absorb everything at the last minute!

5. Work with other people on your homework. Besides being more fun, checking your work with others will help you avoid those little mistakes that cost you time and points. Trying to explain a concept to someone else is an excellent test of how well you understand it yourself.

6. Know your definitions. You will be asked to be clever on the homework and tests, but the tools you will use will always be the definitions (and theorems proved from the definitions). If you don’t know these you will get nowhere.

7. Write up your solutions on your own. Though working together is encouraged, at some point you are responsible for understanding every piece of the problems, and have to be able to write the complete solutions in your own words.

8. Stay organized. When studying for a cumulative exam, your best resources are your old notes and homeworks. Keep these in order and you will have a good record of what the course is about. Since your homework is online, you may want to make a habit of working them out on paper as you do them, so you have a hard copy when it comes time to study.

9. Do problems. It’s very easy to listen to someone else explain something, or read about it and think you understand, but on exams you will be asked to solve problems using these concepts, and doing exactly this is the best way to tell if you are prepared for a test. Re-solve old homework problems from scratch, and do similar ones on your own.