Information Sheet for Math 312 Fall 2023

Class meets: MTRF 2:00 - 2:50 pm in BH 109

Credits: four credits

Teacher: Branko Ćurgus, Proofesor of Mathematics

Office: BH 184A

Office Hour: MTRF at 1 pm or by appointment (in person or see the class Canvas page for a Zoom link)

Email: curgus@wwu.edu

Course website: http://faculty.wwu.edu/curgus/Courses/312_202340/312.html

Sources:

- Proofs in Elementary Analysis, lecture notes by Branko Ćurgus
- Everything said in class and your record of it. Make sure that your record of what was presented in class is correct.
- Me. You can and should ask me any questions. I will help you with a hint or a general strategy for a solution. It would be very useful if you put your questions in writing. It would help if you describe the strategies you attempted to solve a problem and the challenges you encountered.
- Others. You can talk to other students in class and read their notes. This relates particularly to the material already discussed in class. While seeking inspiration and learning from others is essential, always remember to critically evaluate information and trust your analytical abilities.
- You are the source and the steward of your ideas. (This should have been the first item on the list.)

Course objectives: The real numbers play a fundamental role in mathematics, in particular in the branch of mathematics called mathematical analysis. The objective of this course is to provide a rigorous presentation of the basic properties of the real numbers and the fundamental concepts of mathematical analysis: sequences and continuous functions. To be rigorous, as much as possible, we will construct proofs for almost all the statements we discuss. Our main focus will be constructing valid proofs and discussing their validity.

Homework: Your daily homework should consist of studying the material covered in class. The goal is understanding, or even more, internalizing the concepts and methods we study. Your goal is to make what is being learned your own knowledge.

There will be five short homework assignments. I will post the homework problems on Canvas a few days before they are due. The due dates will be posted on Canvas. Each homework will be graded by an integer between 0 and 20, including 0 and 20. The sum of the homework grades, denoted by HW below, will count towards the final grade.

Assignments: There will be one in-class assignment and the final assignment. The assignment during the class will be due one week after it has been posted. I will post the final assignment before the last week of classes and it will be due on the last day of the finals week, on Friday, December 15, 2023 at 11:59 pm.

Exams: There will be only one in-class exam. I will set the date at the later time. Instead of the final exam there will be the final assignment.

Classroom presentations and participation are an important part of this class. You are expected to present your solutions to exercises from the notes in class. I will keep a record of each presentation. I will also keep a record of participation in classroom discussions and your posts in Canvas discussions. Based on the number and quality of your presentations and participation, I will give you a grade at the end of the quarter, an integer between `0` and `100`. This integer will be your classroom presentation grade `CP`.

Grading: Your final grade will be determined using the following formula

$$\texttt{FG} = \left\lceil \texttt{(HW + CP + Ex + AC + AF)/5} \right\rceil.$$

where `HW` is the sum of the homework grades, `CP` is the presentations grade, `Ex` is the exam grade, `AC` is the in-class assignment grade, and `AF` is the final assignment grade. Each of the numbers that appears in the above formula is an integer between `0` and `100`, including `0` and `100`. Your letter grade will be assigned according to the following table.

F : 0 - 39	D−: 40 - 44	D : 45 - 49	D+: 50 - 54	C−: 55 - 59	C : 60 - 64
C+: 65 - 69	B−: 70 - 74	B : 75 - 79	B+: 80 - 84	A−: 85 - 89	A : 90 - 100

How to succeed: Attend classes regularly and do all the suggested homework problems. Do and redo more problems. Read the lecture notes before classes. Ask questions if there is anything that needs to be clarified. Keep organized notes of all your work. Make sure that you *fully understand* each proof we do in class or posted on the class website or Canvas. Do not hesitate to ask a question whenever something is not clear. Ask in class or outside of class. Ask other students in class or me. I will gladly talk to you during my office hours, or you can make an appointment to talk to me at another time. You can find a link to my Zoom office hours on the class Canvas page.

On Your Written Work: Students must submit their work electronically through Canvas Assignments. The only allowable file type is PDF. I cannot grade work submitted by email. Please ensure you produce a high-quality, readable PDF file of your work. LaTeX is a free software designed for typesetting high-quality mathematical documents. I encourage you to learn LaTeX and use it for your writing. As a starting point, you can use my website Getting Started with LaTeX. If you submit your handwritten work, write neatly on paper with a light-colored background using a dark pencil or ink. Please use a good scanning app to produce a high-quality, readable PDF file.

You will have enough time to work on the homework and assignments. Please produce well-written papers. Presenting calculations alone without the context in which they occur and explanations of your reasoning is insufficient for full credit. Writing mathematics in complete sentences organized in meaningful paragraphs is an integral part of learning mathematics. You can use examples in my notes or my writing on the class website as a guide for writing.

Student learning outcomes: By the end of this class, a successful student will demonstrate: (1) the understanding of the mathematical concept of a set and basic operations with sets; (2) the understanding of the mathematical concept of a function and basic definitions related to functions; (3) the understanding of the axiomatic foundation of real numbers $\mathbb{R}$, the most important subsets and properties of $\mathbb{R}$ and the ability to construct rigorous proofs in this setting; (4) the understanding of the fundamental role of the Completeness Axiom and the related concepts of infimum and supremum; (5) the understanding of the basic topological notions in $\mathbb{R}$ and $\mathbb{R}^2$; (6) the knowledge and the understanding of the rigorous definition of the convergence of sequences in $\mathbb{R}$ and ability to construct rigorous proofs in this setting; (7) the

knowledge of the Monotone Convergence Theorem and its relationship to the Completeness Axiom; (8) the understanding of the concept of a subsequence and the definitions of the limit inferior and the limit superior; (9) the understanding of the Cauchy criterion for convergence; (10) the understanding of the ϵ-δ definition of continuity of a function and the ability to use this definition to prove that important elementary functions are continuous; (11) the understanding and the ability to prove the Extreme Value Theorem for continuous functions on closed intervals; (12) the understanding and the ability to prove the Intermediate Value Theorem for continuous functions on closed intervals;

Diversity, Equity, Inclusion: Welcome to my class. I promise to keep my mind open to the mathematical experiences you bring to this class. I want to help each of you to use those personal experiences creatively to build your own understanding of the mathematical content studied in this class. I will try to bring diverse approaches to most concepts. I understand that each of you comes to this class with a diverse background. Please let me know if you are not happy with your background understanding of a particular topic, which is a prerequisite for this class. We can meet outside of class and discuss that topic, find some study material for you, or create some study material especially for you. The goal is to create an environment where you can succeed in this class and be proud of your achievements.

Academic Honesty Policy: Academic dishonesty is not tolerated at Western Washington University. Representing the work of another as one's own is an act of academic dishonesty. For a full description of the academic honesty policy and procedures at Western, see Appendix D in the University Catalog.

Flexibility Statement: This syllabus is subject to change. Changes, if any, will be announced in class or online. Students will be held responsible for all changes.

Sylabii@WWU: Please go to https://syllabi.wwu.edu/ where you will find Syllabi Policies for Students and Campus Resources for Students

The Branko Ćurgus Mathematical Experience: Mathematics has always been a personal experience for me: **The Branko Ćurgus Mathematical Experience**. I want to create an environment where you can embrace mathematics as your personal experience. How can this be achieved? Begin by acknowledging what you don't understand without fear. Discuss challenges openly with others. Open your mind, ask questions. Generously share your questions with others like precious gems. Questions are the gateway to deeper comprehension. Indeed, questions serve as a bridge from confusion to clarity.