Information Sheet for Math 312 Fall 2022

Class meets: MTRF 2:00 - 2:50 pm in BH 114

Credits: four credits

Teacher: Branko Ćurgus, Proofesor of Mathematics

Office: BH 184A

Office Hour: MTRF at noon 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_202240/312.html

Sources:

- Proofs in Elementary Analysis, lecture notes by Branko Ćurgus
- Everything said in class and your record of it. It is your responsibility to make sure that your record of what was presented in class is correct.
- Me. You can and should ask me any question. I will help you with a hint or a general philosophy that could be used. If your question has already been discussed in class I will provide a detailed answer. It would be very useful (for both you and me), if you put your questions in writing. You should describe the strategies that you attempted in solving a problem and difficulties that your encountered.
- You. (This should have been the first item on the list.)
- Others. You can talk to other students in class and read their notes. This relates particularly to the material already discussed in class. If you have had substantial assistance in doing a problem, it should be a matter of honor not to use that problem for your class presentation.

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 that we study. Your goal in learning 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 few days before they are due. The due dates will be posted on Canvas under homework. 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` 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 9, 2022 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 are an important part of this class. You are expected to present your solutions of exercises from the notes. I will grade each presentation by 1, 2 or 3 points. You can also earn points for participation in classroom discussions and your posts on Canvas discussions. At the end of the quarter you will accumulate certain number of points for classroom presentations, call it PP. To convert this number into an integer between 0 and 100 (which will be your classroom presentations grade CP) I will use the following formula:

$$\texttt{CP = Min}\Big\{\big\lceil \texttt{CA + (CStD)*(zsPP)}\big\rceil, 100\Big\}$$

where CA ("the class average") and CStD ("the class standard deviation") stand for the average and the standard deviation of the "class grades" evaluated as

$$\big\lceil \texttt{(HW + Ex + A1)/3}\big\rceil,$$

and the number zsPP is the z-score of your PP number.

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

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

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 is not clear. Keep organized notes of all your work. Make sure that you *fully understand* each proof that we do in class or which is posted on the class website or on 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 be glad to talk to you during my office hours, or you can make an appointment to talk to me at some other time. Here is a link to my zoom office hour or you can find it on the class Canvas page, passcode: Math.

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 make sure that 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.

Since you will have enough time to work on the homework and assignments, your papers should be well-written. Presenting calculations alone without the context in which they occur and explanations of your reasoning is not sufficient for the full credit. Writing mathematics in complete sentences organized in meaningful paragraphs is an integral part of learning mathematics. As a guide for writing, you can use examples in my notes or my writing on the class website.

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 bring diverse approaches to most concepts. For example, it is known that in early developments of mathematics, different cultures used different bases to represent integers. In the last assignment, as an application of infinite series, we will explore positional representation in the hexadecimal numeral system. I understand that each of you comes to this class with a diverse background. If you are not happy with your background understanding of a particular topic which is a prerequisite for this class, please let me know. 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 achievement.

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