

Winter 2021 Math 499S
1:00 - 1:50 MW

Instructor: Dr. Jim Bisgard

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Office Hours: M-F 9:30-10:30 am
and by appointment.

Course Goals: The goal of this class is to reflect on the math major: what have you learned, what do you wish you have learned, and how (if at all) has your thinking about mathematics changed. In addition, this class gives you an opportunity to assemble a portfolio demonstrating various types of proofs, your appreciation of applications of mathematics, as well as a reflection on the differences and similarities of various areas of mathematics. Finally, you will read a mathematical article and prepare a written and oral summary.

For the first few weeks, we will be learning and practicing how to read and summarize a math paper. After that, we will hopefully have some former students speak with us. I would also like to have some discussion about issues relevant to mathematics and society. As graduates with math degrees, people will listen to you and believe you when you talk about mathematics. From that point of view, it is worthwhile and important to consider issues that affect mathematics and society. For example, what mathematics should people learn? How should mathematics be taught in the K-12 system? Who should be teaching mathematics? What is the role of mathematics in making decisions that affect society as a whole? (See for example the various predictions made by mathematical models of the spread of Covid-19 and how policy makers reacted to those predictions.) For these discussions, you may be assigned some reading, and there will be some questions to answer and some questions whose intent to start a discussion. (See for example what mathematics should people learn?)

Grading: You will be required to complete the following assignments:

- Complete a portfolio demonstrating a non-trivial example of each of the following types of proof: (50 points)
 1. Direct Proof
 2. Contrapositive Proof
 3. Proof by Contradiction
 4. Proof by Cases
 5. Proof by Mathematical Induction

- A 3-5 page paper on “An Application of Mathematics” (25 points).

The application should be at the calculus level or higher, and may use ideas from any area of mathematics. As you look for a topic, I suggest that you talk to faculty, either in the math department or in another department! A sign that of a good application is that you can make a good “elevator pitch” for the application. That means, you should be able to say what the problem is clearly and concisely — the details of how math solves that problem are what will fill in the rest of the paper.

- A 3-5 page paper on “What is Mathematics?” (20 points)

This is a paper where you will reflect on the differences and similarities of different areas of mathematics. For example: what are the similarities between linear algebra and calculus? Or calculus and differential equations? Or group theory and linear algebra? Or mathematical modeling and abstract algebra? How are these areas different? Are there similarities in the style of proof for these subjects? What are the differences?

- A paper summarizing a mathematical article (25 points)
This is likely the most difficult assignment for this class, because learning to read and summarize a mathematical article is quite difficult. We will spend the first few weeks practicing how to read and summarize a math paper. A good place to begin looking for an article is the mathematics faculty and mathscinet!
- A presentation summarizing a mathematical article (20 points)
- Class Participation (10 points) (participating in class discussions, as well as writing a one-paragraph summary for each speaker)
- Final Portfolio: containing the proof portfolio and the three papers (200 points).

Deadlines

- Application to graduate at the end of Spring 2021 must be done before January 15.
- The portfolio must be completed **AND** submitted by March 19, 4 pm.
- The application paper has the following due dates (at beginning of class):
Topic: January 27
Draft: February 11
Final Draft: February 25
- The “What is Math?” paper has the following due dates (at beginning of class):
Draft: January 21
Final Draft: February 4
- The article summary paper has the following due dates (at beginning of class):
Choice of article: February 4
Draft: February 18
Final Draft: March 10
- The presentations on the articles will occur on the last four class days, so you should be prepared to present beginning March 3.

You must submit your entire portfolio (including the proofs, the application paper, the “What is Math?” paper, and your article summary paper) into canvas no later than 4 pm on March 19. Failure to do so will result in failing the class! Failing this class means you will not graduate!

Speakers and Participation: We will try to have a few of our math graduates to give talks during the quarter. I am hoping that we will have at least three of them. Attendance for these talks is mandatory, and you are expected to type a one-paragraph summary of each talk. This summary is due at the beginning of the following class. To prepare for your own presentations, in addition to your summary you should also write down two things that you liked about the talk, and two things you didn’t like about each talk.

1 General Class Policies

Come to class when you are able! If you aren't, please let me know ahead of time. In addition, if something comes up that may affect your ability to succeed in this class, please let me know — even if you are unsure if there will be any effect on your performance in class.

Face Coverings and Social Distancing: Due to COVID-19, and under the directive and mandate of public health officials and the president of Central Washington University, students must adopt face covering protocol before entering any classroom or building at CWU until further notice. Students must also follow the social distancing placement marks in buildings and classrooms. If you do not have a face covering Central Washington University can provide one for you. If you have not yet received your CWU-supplied facial covering, please go the SURC Information Desk. Please do so prior to the start of your first class. Face coverings must cover both the mouth and nose. Your mask protects me; my mask protects you. Masks with one-way valves for exhalation do not provide protective value for others — please don't use them as your face covering for any in-person interactions. Thank you for helping keep all of us safe!

Class Recordings: Lecture/discussion will be recorded and posted on Canvas for those who unable to attend synchronously on a given day. However, attendance is considered mandatory, and you should plan to attend synchronously on an ongoing basis. We all benefit from the conversations in-class, and they will be richer for having you there!

When you are attending virtually, please turn on your camera if that is reasonable given your situation, bandwidth issues, etc. If you cannot turn on your camera, please use a profile picture on Zoom that matches your profile picture on Canvas (and please put one up on Canvas) so that we don't have to look at a sea of initials!

Academic Honesty: Consult university policies (CWUP 5-90-040(22), CWUR 2-90-040(22), and WAC 106-125-020) for student conduct, cheating, plagiarism, and other academic expectations. CWU's policies and recommendations for academic misconduct will be followed, leading to disciplinary action up to and including failing the course.

Inclusivity Statement: As a member of a peer learning community, a high degree of professionalism is necessary. **CWU expects every member of the university community to contribute to an inclusive and respectful classroom culture.**

Classroom Conduct: Students in this class are expected to interact with students and the professor professionally. Instances of disruptive conduct, obstructive conduct, or harassment (see definitions below from the Washington Administrative Code: WAC 106-125-020) will be referred to the Dean of Student Success.

Disability Support Services: Central Washington University is committed to creating a learning environment that meets the needs of its diverse student body. Students with disabilities should contact Disability Services to discuss a range of options to removing barriers, including accommodations: Hogue Hall 126, 509.963.2214, DS@cwu.edu

Religious Obligations and Schedule Conflicts: In compliance with RCW 28B.137.010, Central Washington University makes every effort to deal reasonably and fairly with students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Students must present written notice to their instructor *within the first two weeks of class* listing the specific dates on which accommodations are required. Contact the Dean of Student Success at (509) 963-1515 for further information or questions.

Communication: This is going to be an unusual quarter in many ways. Some of you are completely remote. Some of us may need to quarantine in the middle of the quarter. In all things, communication is going to be key. If you have something going on, please let me know (no details you don't feel comfortable sharing, of course, just a general heads-up). As things need to change

during the quarter, I will do my best to let you know as soon as I can. In all things, please extend grace to me and your classmates, and I will do my best to do the same. I will try to respond to email sent between 9 am and 4 pm, Monday through Thursday within three hours. Emails sent later in the evening may not be responded to until the next day. In addition, beginning Friday afternoon and continuing on through Saturday and Sunday, I may only check my email once or twice a day.

I reserve the right to change the policies contained in this syllabus as dictated by developments during the quarter.