

Math 370 Mathematics Seminar Fall 2012

Meeting time: M W F 11:45 am. – 12:55 pm. in PPHAC 235

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Office hours: Monday, Wednesday 10:00 - 11:30 p.m. and by appointment.

Course Goals: This course is a Writing Intensive course intended to serve as a capstone for your mathematical studies at Moravian. The successful student will gain a perspective on several fields of mathematics and how they interact; will learn how to read professional mathematical writing, and gain experience in communicating mathematics through different forms of writing, oral presentations and class discussions.

Attendance: During each class meeting, you will be discussing assigned readings, making a presentation, serving as an active audience, or working with other students on a mathematical problem or activity. For this reason, regular attendance is essential. Your participation in all of these activities determines your class participation grade (15%).

Projects, Papers and Presentations: For each of these you will choose the topic, but it must be approved by the instructor.

- Math History paper (Paper 15%): A 5 page paper and a 10-12 minute oral presentation on a history of mathematics topic.
- Text project (Paper 15%): A 5 page paper and a 10-12 minute oral presentation on a theorem from the text. The paper and talk should also include background on the problem and the mathematician who solved it.
- Extra Chapter (Paper 15%): A 5 page written summary and 20-25 minute oral presentation on a chapter of a textbook from a mathematics course that you have taken (216 and above) that was not covered in the course.
- Journal article (Paper 15%): A written summary and 15-20 minute oral presentation of a journal article of your choice.
- Research project and final paper (Paper 25%): A 10 page paper and 25 minute oral presentation on a well-known problem in a field of mathematics.

For all the projects you will be required to have the topic approved by the instructor on the day the topic is due and to have someone edit a first draft. It is recommended that you have a second proofreader and a second draft. All drafts

should be double spaced. On the due date you will turn in all the drafts, editorial comments, and the final draft. Proof readers for first drafts are indicated below.

Whenever you are part of the audience for a presentation, you will critique the presentation. The instructor will distribute questions for you to take notes. A formal, written critique will be turned in at the next class meeting. These critiques are part of your class participation grade.

Accommodations:

Students who wish to request accommodations in this class for a disability should contact Elaine Mara, assistant director of learning services for academic and disability support at 1307 Main Street, or by calling 610-861-1510. Accommodations cannot be provided until authorization is received from the Academic Support Center.

Mathematics Department Academic Honesty Policy

The Mathematics Department supports and is governed by the Academic Honesty Policy of Moravian College as stated in the Moravian College Student Handbook. The following statements will help clarify the policies of members of the Mathematics Department faculty. In all at-home assignments which are to be graded, you may use your class notes and any books or library sources. When you use the ideas or thoughts of others, however, you must acknowledge the source. You also may not use a solution manual or the help (orally or in written form) of any individual other than your instructor. If you receive help from anyone other than your instructor or if you fail to reference your sources, you will be violating the Academic Honesty Policy of Moravian College. You may work with your fellow students on homework which is not to be graded. You are responsible for understanding and being able to explain the solution of all assigned problems, both graded and ungraded. All in-class or take-home tests and quizzes are to be completed by you alone without the aid of books, study sheets, or formula sheets unless specifically allowed by your instructor for a particular test.

Tentative Dates:

- **September 7 – Math History paper topic and preliminary sources due**
- September 14 – First draft of Math History paper due
- September 21 – Math History paper oral presentations begin, papers due
- **September 19 – Text project topic due**
- September 28- First draft of text project due
- October 5- Text project oral presentations begin, paper due

- **October 7-Research project topic and preliminary sources (at least 3) due**
- **October 12-Extra chapter topic due**
- October 14, 17-Individual conferences for Extra Chapter paper
- October 24 – Extra Chapter presentations begin, papers due
- **October 28 – Journal article choice due, first draft of research project due**
- October 31, November 2-Individual conferences about your journal article
- November 9-First draft of journal article due
- November 14 – Journal article presentations begin, paper due
- November 18 – First draft of Research project
- November 28 – Research paper presentations begin
- December 2 – Research paper due

A few things to consider when preparing presentations:

- When giving a presentation always begin with the source; author, journal or book, title and pages.
- Who is the audience? Gear it appropriately.
- Among other things you will be judged on how well you know the material. Although you may use cue cards, you should not be just reading from them when you give a presentation.
- When preparing a presentation; practice, practice, practice,..... and time yourself

History of Mathematics Project

Topic Due: Wed. 9/7

First Draft Due: Wed. 9/14

Paper Due: Fri. 9/21

Presentations begin: Wed. 9/21 (10-12 min.)

First draft proofreader: Writing lab

Audience: senior math students

Choose a topic from the history of mathematics that is interesting to you. It could be a biography of a famous mathematician, the history of a famous constant, or the development of a field of mathematics. You will need to prepare

an approximately 5 page paper on your topic. You should use several library resources in your paper. In addition to your paper you will also be giving a 15 minute oral presentation in class.

Things to consider:

- Your audience for this assignment is your classmates, so be sure to include some mathematics in your paper. You should have at least one theorem and proof.
- When introducing new mathematical terms keep in mind that not everyone has taken the same courses as you, so you may need to define some ideas that are familiar to you. For instance, you may assume everyone in the class remembers how to manipulate matrices, but you shouldn't assume everyone knows what a group is.

Text Project

Topic Due: Mon. 9/19

First Draft Due: Wed. 9/28

Paper Due: Wed. 10/5

Presentations begin: Wed. 10/5 (10-12 min.)

First draft proofreader: classmates

Audience: midrange math students

Choose a major theorem from Dunham's text. Research the background on the problem and its significance as well as the mathematician who solved it.

You should prepare your talk as an Epsilon talk but you may assume that the audience members are undergraduate students who have taken the 5 core courses in mathematics; 3 semesters of calculus, linear algebra, and discrete mathematics. When you are in the audience for your classmates you should actively play the role of a such a student. If the speaker uses a term beyond one of these courses then ask about it.

Extra“Chapter” Assignment

Topic Due: Wed. 10/12

Conferences begin: Fri. 10/14

Paper Due: Mon. 10/24

Presentation begin: Mon. 10/24 (20-25 min.)

First draft proofreader: Classmate

Audience: senior math students

You should think about what was your favorite math course here at Moravian (216 and above). Choose one course and read through the next chapter from the book in that course. You should prepare a 25 minute presentation based on some or all of the material in that chapter and then write a summary of the material.

Things to consider:

- Most likely you will not be able to cover an entire chapter in 25 minutes. Feel free to focus on one or more sections from the chapter.
- Be sure to provide whatever background your audience will need. Not all of you have taken all the same courses.
- Try to relate the new material to the rest of the course. What are the big ideas of this chapter? What were the big ideas of the course? How does this chapter relate to the rest of the course?
- This is a talk for an audience of advanced mathematics students so be sure to include some mathematics such as theorems, proofs, and example computations.

Journal Article

Topic Due: Fri. 10/28

Conferences begin: Mon. 10/31

First Draft Due: Wed. 11/9

Paper Due: Mon. 11/14

Presentation: Mon. 11/14 (15 min.)

First draft proofreader: Professor Schultheis

Audience: mathematicians

You should choose an article from a higher level journal than the first article assignment such as the Mathematics Magazine or The American Mathematical Monthly. The article you choose should require some effort on your part to understand and assimilate.

In addition to a 15 minute oral presentation you should prepare a written summary of the paper that is approximately 3-5 pages long. This summary should include what you think are the main results of the paper and how they fit into the larger field of mathematics. Your audience for this paper is your classmates.

Things to consider:

- Try to use the abstract of articles to help you gauge the difficulty. If you don't understand most of the terms in the abstract then the paper might be too difficult.
- This is a talk for an audience of mathematicians so be sure to include some mathematics such as theorems, proofs, and example computations.
- In your paper you probably won't have room to include proofs, so instead summarize the results without proof.
- Your summary paper should not simply be a rewriting of the original article. Try to identify the "big ideas" in the article and explain why they are interesting.

Research Project

Topic Due: Fri. 10/7

First Draft Due: Fri. 11/18

Paper Due: Fri. 12/2

Presentation begin: Mon. 11/28 (25 min.)

First draft proofreader: Professor Schultheis or Writing center

Audience: mathematicians

For this assignment you will research a well-known problem from the history of mathematics. You will be investigating such questions as;

1. Why was the problem first introduced, why is it of interest?
2. Who worked on the problem? What kind of techniques did they use? How successful were they?
3. Who solved the problem? What was the effect of the solution on the future of mathematics?

In addition to a 25 minute oral presentation on your project you should prepare a 10 page paper. Your paper should be in a form similar to the papers we have been reading all semester. You should start with an Introduction section where you briefly summarize what you will be talking about in the paper. You should also include some basic and interesting background on any of the players. The final section should discuss the impact the problem had on the future of mathematics.

Things to consider for your presentation:

- This is a talk for an audience of mathematicians so be sure to include some mathematics such as theorems, proofs, and sample computations.

Things to consider for your write-up:

- Be sure to give a brief background of your problem. Where did it come from? Why is it interesting? What have other people proven about it?
- Your audience is your classmates, so provide appropriate detail in your proofs. That is, don't assume too much knowledge, but on the other hand, you don't need to include all the minute details.

A partial list of potential problems: Pythagorean Theorem, Basel Problem, Cantor's Theory of the Infinite, Brachistchrone, Tautachrone, a Problem from Archimedes, Quadratic Reciprocity, Fundamental Theorem of Arithmetic, Fundamental Theorem of Calculus, any of Hilbert's Problems.

A few good sources to get you started:

Dunham, William, *Journey Through Genius*, Penguin Group (USA), 1991.

Dunham, William, *The Calculus Gallery: Masterpieces from Newton to Lebesgue*, Princeton University Press, 2008.

George F. Simmons, *Differential Equations With Applications and Historical Notes*, McGraw Hill, 1991.

Ben Yandell, *The Honors Class: Hilbert's Problems and Their Solvers*, Peters, A K, Limited, 2003.

Note: This syllabus is a guideline for the course. It may be necessary to make changes during the semester. I will announce any changes in class.