Math 370   Mathematics Seminar   Fall 2011
Meeting time: M W F 1:10 pm. – 2:20 pm. in PPHAC 112
Instructor: Fred Schultheis
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Office hours: Monday, Wednesday 12:00 - 1:00 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 10%, Presentation 5%): A paper and a 15-minute oral presentation on a history of mathematics topic.

- Text project (Paper 10%, Presentation 5%): A paper and a 15-minute oral presentation on a theorem from the text. The paper and talk should also include background an the problem and the mathematician who solved it.

- Extra Chapter (Paper 10%, Presntation 5%): A 35-minute 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.

- Research article (Paper 10%, Presentation 5%): A written summary and class presentation of each of two research articles of your choice.

- Research project and final paper (Paper 20%, Presentation 5%): Find a well-known problem in a field of mathematics that interests you and research the history of the problem and at least one of it's solutions. You will write a paper and give a presentation on your research.

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. All first drafts should be double spaced. On the due date you will turn in the

first draft, editorial comments, and the final draft. Proof readers for first drafts are indicated below.

Accommodations: Students who wish to request accommodations in this class for a disability should contact Mr. Joe Kempfer, Assistant Director of Learning Services for Disability Support, 1307 Main Street (extension 1510). Accommodations cannot be provided until authorization is received from the office of Learning Services.

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 un-graded. 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 8 – Math History paper topic and preliminary sources due

- September 15 – First draft of Math History paper due

- September 20 – Math History paper

- September 22 – Math History paper oral presentations

- September 24 – First text project topic due

- October 6 and 8 – 20-minute oral presentations about your first research article

- October 13-Extra Chapter topic due

- October 18-20: Individual conferences for Extra Chapter paper

- October 20 – Research project topic and preliminary sources (at least 3) due

- October 25, 27 and 29 – Extra Chapter 50-minute presentations

- October 27 – Research article choice due

- November 3 and 5-Individual conferences about your research article

- November 8-First draft of research article due

- November 10 and 12 – 30-minute oral presentation about your second research article

- November 15 – Research project draft due

- December 1 – Research paper due

- December 3, 6 and 8 – Research project 30-minute presentations

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. 9/8
First Draft Due: Mon. 9/15
Paper Due: Fri. 9/20
Presentation: Mon. 9/22 (15 min.)
First draft proofreader: Writing lab.
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: Wed. 9/24
Conferences: Wed. 9/29 and Fri. 10/1
First draft proofreader: Classmate
Paper Due: Day of presentation
Presentation: Wed. 10/6 and Fri. Oct. 8 (30 min.)
First draft proofreader:
Choose a major theorem from Dunhams text Research the background on the problem and its signifcance as well as the mathematician who solved it.

You should prepare your talk as an Epsilon talk. That is, assume most of the audience members are freshmen taking Calculus I. In fact, when you are in the audience for your classmates you should actively play the role of a freshman. If the speaker uses a term a freshman would not be familiar with then ask about it. If the speaker dives into a convoluted proof a freshman can't follow then ask about it.

Things to consider: Your audience for this assignment is your freshmen, so be sure to include some mathematics but make sure its accessible.

Extra"Chapter" Assignment

Topic Due: Wed. 10/13
Conferences: Mon.10/18 and Wed. 10/20
First draft proofreader: Professor Schultheis
Paper Due: Day of presentation
Presentation: Mon. 10/25, Wed. 10/27, and Fri. 10/29
First draft proofreader: Classmate
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 50 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 50 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 mathematicians so be sure to include some mathematics such as theorems, proofs, and example computations.

Journal Article

Topic Due: Wed. 10/27
First Draft Due: Mon. 11/8
Conferences: Wed. 11/3 and Fri. 11/5
First draft proofreader: Professor Schultheis
Paper Due: Day of presentation
Presentation: Wed. 11/10 and Fri. 11/12 (30 min.)
First draft proofreader:
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 2 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: Wed. 10/20
First Draft Due: Mon. 11/15
Paper Due: Wed. 11/31
Presentation: Fri. 12/3, Mon. 12/6, and Wed. 12/8
First draft proofreader: Professor Schultheis or Writing center

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.