Intro to Higher Mathematics

Fall 2014

MTH 300 Section 101, CRN 3263

**M,T,W,R 1:00 – 1:50 Smith Hall 509**

**(Tentative 8/25/2014)**

# Instructor: Dr. Bonita A. Lawrence

311 Smith Hall, Differential Analyzer Lab

696-3040, 696-3854, lawrence@marshall.edu

Office Hours: 3:00 P.M. – 4:00 P.M. T,R

9:00 A.M. – 10:00 A.M. M, W

Or a time that we can find that

works for both of us!

**Textbook and**

**Required Materials:** Bridge to Abstract Mathematics

Ralph W. Oberste-Vorth, Aristides Mouzakitis, Bonita A. Lawrence

Publisher: Mathematical Association of America

I will grade your homework papers and return them to you. I will ask you to collect these papers in a notebook and submit this portfolio at the end of the semester.

**Course Prerequisites:** MTH 230 – Calculus II

In this course our primary goal is to develop your ability to read, with understanding, proofs presented to you and to construct logical and valid proofs of your own. One of area of mathematics we will use as our proving ground will be the theory of functions. Your calculus training will serve as a foundation for these discussions.

**Course Objectives:** This course is designed to develop your skills for proof writing. Mathematics is a collection of axioms, definitions, lemmas, theorems and corollaries that are woven together in a beautiful structure. The development of our mathematics relies on the discovery of new ideas. Such ideas can only become part of the mathematics we use and appreciate if they can be proved using established results. In this course, my primary goals are to teach you to read and understand classical mathematical proofs and to write logical and valid proofs of your own. This can be a fantastic experience that is a bit different than the mathematics courses you are used to and will be very much a creative endeavor.

I am looking forward to an exciting semester!

Success in the course will be measured by your ability to meet the following learning outcomes.

The ability to

1. Exhibit an understanding of mathematical logic.

Skill Development: Individual, small group and whole group analysis of

a) compound mathematical statements to determine their truth values, b) the logical structure of classical proofs. Daily exercises with review the following day.

Assessment: Written and oral presentations of a) truth tables and b) proofs of classical theorems.

1. Exhibit an understanding of a variety of proof writing techniques.

Skill Development: Individual, small group and whole group analysis of proofs of propositions (including classical theorems) as well as arguments that fall short of proving a proposition. Daily exercises with review the following day.

Assessment: Written and oral presentations of proofs of a) propositions that require you to describe the techniques used and how they were applied to the particular proposition and b) analyses of arguments that fall short of a valid proof. (We call these poofs.)

1. Construct formal proofs of propositions that address concepts discussed during the course of the semester.

Skill Development: Individual, small group and whole group creation of proofs of stated propositions. Daily exercises with review the following day.

Assessment: Written and oral presentations as well as group discussion with peers of various proofs for stated propositions.

1. Present your work clearly and concisely in both written and oral form. Organization and logical flow will be the secrets to success in meeting this objective.

Skill Development: Individual, small group and whole group creation of clear and concise proofs of stated propositions. Daily exercises with review the following day.

Assessment: All written assignments and oral presentations at the board.

1. Recognize and appreciate various approaches to the same problem.

Skill Development: Individual, small group and whole group discussions with peers of various approaches of proofs.

Assessment: Exercises that require the use of more than one approach to an exercise or proof of a proposition.

**Grading Procedure:** You grade will be calculated using the following percentages:

Homework Portfolio: 10 %

Boardwork: 10 %

Exam I 20%

Exam II 20%

Exam III 20%

Final Exam: 20 %

There will be four exams during the semester including the final exam, (**Friday, December 12, 2014, 12:45 P.M. – 2:45 P.M**.). The dates for the chapter exams can be found in the schedule of events at the end of this document. In the event you are not able to take the exam on the scheduled date because of serious circumstances, (see http://www.marshall.edu/academic-affairs/policies/) please contact me before the scheduled exam time so that we can plan a time for you to take the exam early.

You will be assigned homework in every class period. You will submit your homework at the beginning class. I will not accept late homework. I will return your work and ask you to collect them in a notebook. This portfolio will be collected at the end of the semester.

I will ask to you present some of your fine works of art at the board for my enjoyment as well as that of your peers. This is what I call “Boardwork”. You must visit the board at least **three** times during the semester to get full credit for your boardwork.

Your final grade will be determined using the following scale:

90% - 100% A

80% - 89% B

70% - 79% C

60% - 69% D

0% - 59% F

My best advice (It’s free!) is for you to keep up with your reading and homework assignments.

**General University**

**Policies:** By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to [www.marshall.edu/academic-affairs](http://www.marshall.edu/academic-affairs) and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to <http://www.marshall.edu/academic-affairs/?page_id=802>

**Attendance Policy:** I expect you to be in class every day you are physically able. It is your responsibility to determine what you missed in the event you are unable to attend class. Requesting notes from a colleague would be wise. I will be happy to let you know the assignment for the particular day you missed.

**Academic Dishonesty Policy:** I expect you to do your own work. You can certainly discuss the homework problems with your colleagues but what you present to me for assessment must be your own. The University’s policy concerning academic dishonesty can be found on pp. 666 – 68 in the Marshall University Undergraduate Catalog at http://www.marshall.edu/ucomm/files/web/UG\_14-15\_published.pdf.

**Policy for Students with Disabilities:** Marshall University is committed to equal opportunity for all. Students with physical, learning or psychological disabilities should contact the Office of Disabled Students Services (DSS) in Prichard Hall 117, 304 696-2271 and provide documentation of their disability. After consultation the DSS coordinator will send a letter to the student’s instructors describing the accommodations the student will need. For more information, go to <http://www.marshall.edu/disabled> or call or visit the office in Prichard Hall.

**University Computing Services’ Acceptable Use Policy:**

There is a University policy concerning the acceptable use of University computers. The information can be found at <http://www.marshall.edu/ucs/CS/accptuse.asp>. You are responsible for making yourself aware of this important information.

**Affirmative Action Policy:** In the spirit of equal opportunity for all, Marshall University has an Affirmative Action Policy. This can be found in the 2010 – 2011 Undergraduate Catalog on p. 63 or online at http://www.marshall.edu/ucomm/files/web/UG\_14-15\_published.pdf .

**Inclement Weather Policy:** In the event of bad weather that may prevent us from coming to school, Marshall has a policy that describes how things will be handled. (Note that I have been here for 11 years and we have only shut down school once during this time.) The policy can be found on pp. 64-65 of the 2010 – 2011 Undergraduate Catalog or on line at http://www.marshall.edu/ucomm/files/web/UG\_14-15\_published.pdf.

**Have a great semester and let me know if I can help you. If I can’t answer your question, I’ll find someone who can!**

**Cheers!**

**Dr. Lawrence**

**A Program of Events for MTH 300**

**Class Days Topics and Events**

**Week 1 A Historical Perspective and the**

**August 25 - 28 Axiomatic Method**

**Mathematical Statements and Connectives**

**Symbolic Logic**

**Compound Statements**

**Boardwork**

**Week 2 Predicates and Quantifiers**

**September 2 - 4 Quantified Statements**

**Loads of truth tables**

**Direct Proof**

**(And the Proof Writing Begins…)**

**Boardwork**

**Week 3 Proof by Contraposition**

**September 8 - 11 Proof by Contradiction**

**Proof Constructions**

**The Poof! (not proof)**

**Boardwork**

**Week 4 Proof by Induction**

**September 15 - 18 Complete Induction**

**Loads of Proof Writing**

**An Introduction to Set Theory**

**Boardwork**

**Exam I - Thursday**

**Week 5 Set Theory Continues…**

**September 22 - 25 Unions and Intersections**

**(including arbitrary collections)**

**Loads if Proof Writing**

**Boardwork**

**Week 6 Functions and Relations**

**September 29, 20 Injective, Surjective and Bijective**

**October 1, 2 Composition Functions**

**Proof, Proof, Proofs…**

**Boardwork**

**Week 7 More Function Work!**

**October 6 - 9 Inverse Functions and Inverse Images**

**Relations on a Set**

**Properties of Relations**

**Boardwork**

**Week 8 Order Relations**

**October 13 - 16 Equivalence Relations**

**Boardwork**

**Exam II - Thursday**

**Week 9 Cardinality of Sets – An Intro**

**October 20 - 23 Finite Sets**

**Infinite Sets**

**Boardwork**

**Week 10 Countable Sets**

**October 27 - 30 Uncountable Sets**

**Boardwork**

**Week 11 Properties of Number Systems -**

**November 3 - 6 Primary and Secondary**

**Construction of the Set of**

**Natural Numbers**

**Boardwork**

**Week 12 Time Scales**

**November 10 - 13 Jump Operators**

**Limits and Continuity**

**Boardwork**

**Exam III - Thursday**

**Week 13 Time Scales, continued**

**November 17 - 20 The Delta Derivative**

**Week 14 Thanksgiving Break**

**November 24 - 28 Take a break and have some fun!**

**Week 15 Review and Recall**

**December 1 - 4 Boardwork**

**Final Exam:**

**Friday, December 12th, 12:45 P.M. – 2:45 P.M.**