# FOUNDATIONS OF MATHEMATICS

MATH 3425.001 | SPRING 2024

Course Description

In this class, you will learn how to write proofs. We will start by studying the logic behind proofs and why proofs work. We will start by constructing very simple proofs like proving that the sum of two even numbers is even. We will then write proof about topics with which you are very familiar: sets, relations functions and number systems. We will eventually work our way up more interesting topics like the different types of infinity. This course has a prerequisite of Math 2414 Calculus II.
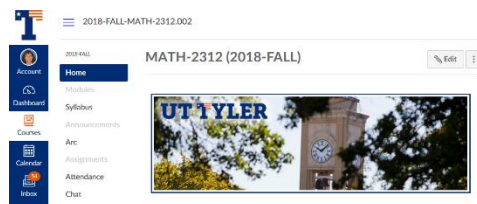
Textbook
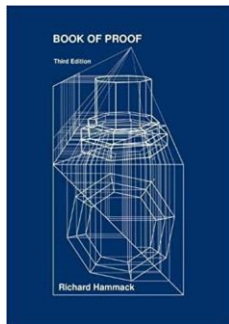
The Book of Proof by Richard Hammack. This is a free downloadable book that you can find at his website
https://www.people.vcu.edu/~rhammack/BookOfProof/BookOfProof.pdf
If you want a dead tree version, Amazon sells the paperback for about $25.

Website

You will be using Canvas. Go to www.uttyler.edu/canvas to log into Canvas using your regular patriots account. If you have enrolled in the course, you should have access to the website. You will find important documents, grades, lecture notes, and announcements on Canvas.

Attendance is mandatory and attendance records will be kept. Notify Dr. Koslover in advance if you must miss a class, be late for a class or leave early. (Official University Policy: Class attendance is the responsibility of the student. When a student has a legitimate absence, the instructor may permit the student to complete missed assignments. In many cases class participation is a significant measure of performance, and non-attendance may adversely affect a student's grade. When a student's absences become excessive, the instructor may recommend that the student initiate a withdrawal.)

Learning Outcomes

At the conclusion of the course, the student should be able to:

1. Reason mathematically and apply the rigor necessary to construct proofs and determine the validity of a given argument.   (Communicate, construct proofs, critical thinking)

2. Use a variety of techniques – such as mathematical induction, proof by contradiction and direct application of axioms and previously proved theorems – to prove propositions. (Construct proofs)

3. Persuasively communicate mathematical ideas, both verbally and in writing, using clear and concise mathematical language, including terminology, notation and grammar. (Communicate)

4. Draw reasonable inferences and conclusions using mathematical tools such as truth tables, Venn diagrams, digraphs and Hasse diagrams. (Critical thinking)

Course Evaluation

At the end of the semester, you will find your final grade on my.uttyler.edu. It will also be posted on Canvas.
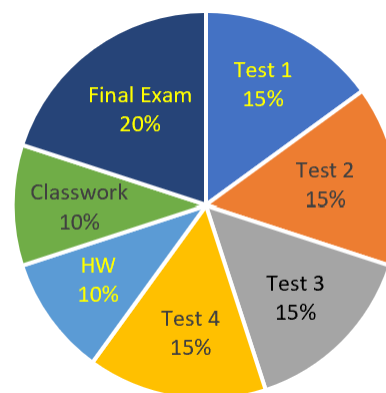A final course grade of
     90% is guaranteed to be at least an A
     80% is guaranteed to be at least a B
     70% is guaranteed to be at least a C
     60% is guaranteed to be at least a D.
All grades below 60% will be F.

Final Exam 20%, Test 1 15%, Test 2 15%, Test 3 15%, Test 4 15%, HW 10%, Classwork 10%

The Plan

(10% each): Homework will be assigned daily. Assignments will appear on Canvas. Assignment will be due Wednesday of the following week. You will need to post your homework solutions on Canvas before class starts as a pdf file. If you turn it in after class starts, but before midnight of the same day, you will get a 10% grade reduction. No credit will be given for assignments turned in after Wednesday, except for extreme situations like hospitalization.

Be prepared to present any problem on the assignment. Presentation of problems will be part of your classwork grade.

I will grade at least three problems from each assignment. The first one, I will pick and will grade on everyone's paper. The second problem will come from a choice of two problems that you pick. Write your choices on the first page of the assignment. I will grade your first choice unless it is the same as the one that I picked. If we pick the same problem, I will grade your second choice.

The third problem, which will be called problem zero on every assignment except the first. It will read "Look at the solution to the previous homework assignment and find a problem that you think you missed. Explain your error or your confusion and whether it is now resolved. Please do not pick a problem where your error was misreading the problem, doing the wrong problem or making an arithmetic mistake. Pick a mathematical confusion or error.

If you think you did every problem perfectly, discuss something that you learned while doing the assignment, something that will help you as a student, perhaps a different way of doing a problem. Describe what you found.

The point is not to redo the problem. The point is to state what your mathematical misunderstanding is and whether you resolved it."

Problem 0 will be worth 3 pts on each assignment. The other two will be worth 3, 4 or 5 points depending on how hard they are or how clever you need to be to solve them. I will generally pick 4-point problems to grade and I will not pick problems that require you to be clever. I will pick proofs much more often than any other type of problem. If you do all the problems except the proofs, do not expect to get a passing grade. Also, your homework grade will be low if you only pick easy problems. Any problem for which you have made a serious attempt will get some credit whether it is correct or not. Note that copying the statement of the problem does not constitute a serious attempt.

The real purpose of homework is practice. I encourage students to discuss the homework only in general terms outside of class. It is good to share general ideas, but you will not be likely to pass unless you do the hard work of learning to write proofs yourself. Do not just copy your friend's assignments or search for solutions on the internet. Yes, your

homework grade may be reduced following this advice, but it is only worth 10% of your grade. If you do not practice solving problems and writing those solutions independently, you may not be able to pass the exams. That will affect 80% of your grade.

During class, there will be many activities and assignments. I will ask you to turn in these assignments at the end of class for credit. Additionally, you will be scored on your participation during class. I will ask many questions during class. I don't expect you to know the answers and it is okay to be wrong. There will be no penalties for being wrong. I want you to try to figure the problems out during class. You will not be insulted or humiliated for getting incorrect answers, because you are not expected to know the answers. You will get credit for participation whether or not your answers are correct. If you do know answers, from other classes or your own reading, please only answer one question during class. This will give you participation credit, but will allow others to receive theirs as well.

Additionally, every Friday except on test days, we will have homework presentations. On test weeks, presentations will be on Wednesday. You will be asked to get up and present your solutions. If you have not done a problem, you may be asked to get up and take a stab at it. If you started a problem, but couldn't finish it, you will be asked to present what you did, and then get suggestions from the rest of the class on how finish.

Friday's audience will be expected to politely comment on the presentations and will receive classwork credit for good comments. Commenting must be about the mathematics, not trivialities like the person's handwriting. Comments about how you did the problem differently will not usually get much credit, unless your method is markedly different. If the presenter gets stuck or makes an error, much credit will be given for giving the presenter helpful hints, but not doing the problem for them.

It's not that I'm so smart, it's just that I stay with problems longer. __Albert Einstein

TESTS **(15% each) and** **FINAL EXAM** **(20%):** There will be four tests and a final exam. These exams will test your knowledge of the material taught in the class and practiced on the homework. As on the homework and the in-class presentations, students should expect to write high quality proofs on all exams. While some memorization of definitions and some computations will be required, it will not be the main emphasis.

Success is dependent on effort. __Sophocles

Final Exam: Monday, April 29, 8 – 10 AM

Please don't plan your travel to start before the date the final exam is scheduled!

Make-ups

Make-ups for **documented** absences that are **required** as part of a UT Tyler obligation (e.g. athletes participating in an event, participating in a debate contest, etc.) or for religious observation will be granted. For all make-ups of this type, prior notification of at least one week and documentation are required. Other make-ups are granted only in extreme cases such as hospitalization and at the sole discretion of the instructor.

Make-ups will be allowed for the following excused absences.
1) Illnesses, with a doctor's note, no exceptions.
2) Your child's illness, with a doctor's note.
3) Court appearances, including citizenship court, with documentation
4) Weddings, funerals or military advancement with documentation **and** a photograph showing that you attended the event.

Doctor's notes must be dated either before you miss the class or within 2 days after you missed the class, unless you or your child are hospitalized. In case of hospitalization, bring evidence of hospitalization.

Make-ups for test must be taken within 3 days after returning to class except for lengthy illnesses or hospitalizations.

Other Details

Calculator Policy: Generally, calculators will not be needed, but you are welcome to use non-graphing calculators for all quizzes and tests. However, you may not use your phone as a calculator. Additionally, all work must be shown. When calculators are needed, I will have some available.

Cell phones and other electronic devices: Please set your cell phones to silent mode. If you are expecting an emergency call, please notify the instructor in advance, sit near the door, and answer the phone outside. You will not be allowed to wear electronic devices (except hearing aids) during an exam. During tests, cell phones must be turned off and placed in sight on your desk.

Calendar

JANUARY			FEBRUARY			MARCH			APRIL		
MON	WED	FRI	MON	WED	FRI	MON	WED	FRI	MON	WED	FRI
					2			1	1	3	5
15	17	19			**Test 1**			*		*	*
MLK Day	First Day		5	7	9	4	6	8	8	10	12
22	24	26		*	*		*	*	Eclipse Day	**	**Test 4**
	*	*	12	14	16	11	13	15	15	17	19
29	31			*	*	Spring Break				*	*
Census Day	**		19	21	23	18	20	22	22	24	26
				**	**Test 2**		**	**Test 3**		*	*
			26	28		25	27	29	29	30	
				*		Drop Day	*	*	**Final Exam**		

HW due on Wed
*Presentations on Fri or Wed
Final 8 – 10 AM

Each student will have one opportunity to rewrite missed problems on ONE test to earn up to 50% of the lost points. When you get a test back, if you decide to use your golden ticket, you will have one week to turn in the rewrites.

The tests will get progressively harder, so you are encouraged to save your ticket for test 3 or test 4. However, you may choose to apply the ticket on any test.

The ticket may not be used on the final exam.

You may not use the ticket retroactively at the end of the semester.

Tickets are not transferable.