

MATH 155: Mathematics, A Way of Thinking

Fall 2010, 3 Credits, MWF 3:10 pm., MRC 418

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Hours: M—F 9—10 , and by appointment

Please note: I realise that you may not be free at 9 am on any morning. However, I am in my office from around 8 until noon (11 on Fridays) and all through the day on Tuesdays, so there is lots of time for you to make an appointment as needed.

Final Exam: **Thursday 16th December 7:40—9:40 am**

Course Description: An investigation of topics, including the history of mathematics, number systems, geometry, logic, probability, and statistics. There is an emphasis throughout on problem solving. Recommended for general education requirements, B.S. degree.

Text: *Excursions in Modern Mathematics*, by Tannenbaum 7th ed (Prentice-Hall, 2010)

CORE SKILL OBJECTIVES:

These skills are related to the General Education core abilities document. They are also written to refer to the various INTASC standards for the purposes of the Elementary Education program.

Thinking Skills: The students will engage in the process of inquiry and problem solving that involves both critical and creative thinking.

Students will

- (a) ... explore writing numbers and performing calculations in various numeration systems. (INTASC 1)
- (b) ... solve simple linear algebraic equations. (INTASC 1)
- (c) ... explore linear and exponential growth functions, including the use of logarithms, and be able to compare these two growth models. (INTASC 1)
- (d) ... explore a few major concepts of Euclidean Geometry, focusing especially on the axiomatic-deductive nature of this mathematical system. (INTASC 1)
- (e) ... develop an ability to use deductive reasoning, in the context of the rules of logic and syllogisms. (INTASC 1)
- (f) ... explore the basics of probability. (INTASC 1)
- (g) ... learn descriptive statistics, including making the connection between probability and the normal distribution table. (INTASC 1)
- (h) ... learn the basics of financial mathematics, including working with the formulas for compound interest, annuities, and loan amortizations. (INTASC 1)
- (i) ... solve a variety of problems throughout the course which will require the application of several topics addressed during the course. (INTASC 1)

Life Value Skills: The students will analyze, evaluate and respond to ethical issues from informed personal, professional, and social value systems.

Students will

- (a) ... develop an appreciation for the intellectual honesty of deductive reasoning. (INTASC 9)
- (b) ... understand the need to do one's own work, to honestly challenge oneself to master the material. (INTASC 1)

Communication Skills: The students will communicate orally and in writing in an appropriate manner both personally and professionally.

Student will

- (a) ... write a mathematical autobiography. (INTASC 9)
- (b) ... do group work (labs and practice exams), involving both written and oral communication. (INTASC 4)
- (c) ... turn in written solutions to occasional problems. (INTASC 1)

Cultural Skills: The students will understand their own and other cultural traditions and respect the diversity of the human experience.

Student will

- (a) ... explore a number of different numeration systems used by other cultures, such as the early Egyptian and the Mayan peoples. (INTASC 1)
- (b) ... develop an appreciation for the work of the Arab and Asian cultures in developing algebra during the European "Dark Ages". (INTASC 1)

- (c) ... explore the contribution of the Greeks, especially in the areas of Logic and Geometry. (INTASC 1)

It is also worth mentioning the NCTM (National Council of Teachers of Mathematics) "standards" for mathematics education, because they are also a list of some overall goals we strive for in this course:

The students shall develop an appreciation of mathematics, its history and its applications.

The students shall become confident in their own ability to do mathematics.

The students shall become mathematical problem solvers.

The students shall learn to communicate mathematical content.

The students shall learn to reason mathematically.

FURTHER COURSE NOTES:

This course is aimed at the needs of elementary education majors and as such is the first part of a three-course, 12-credit sequence (MATH 155-255-355). This is a "content" course rather than a "methods" course (teaching methods are addressed in the latter two courses in the above sequence). This is what people generally call a "Liberal Arts Mathematics Course", meaning that it covers a wide variety of topics, has an emphasis on problem solving, and uses a historical and humanistic approach. Consequently, the course is considered appropriate for the general education requirements and is open to all students.

Assessment Procedures:

Semester grades in this course will be awarded according to a standard scale:

(90% and above) = A

(80%--89%) = B

(70%--79%) = C

(60%--69%) = D

(Below 60%) = F

Semester grades are calculated purely on a points basis, that is, the letter grades you earn on individual exams are purely guidelines for you to gauge your progress. For example, if you miss a particular grade on an exam by a certain number of points, it is still possible to make up those points (and get into that grade bracket) in other parts of the course, perhaps on the next exam. On the other hand, just because you got a good grade on one test, you should realize that you can lose enough points to get into a lower grade bracket by doing poorly in another area of the course. Once again: it is points that count.

Homework questions 100 pts.

(Full credit is given for each completed assignment)

Homework will be due one class week after it has been assigned. Any questions regarding how to do particular homework problems will be welcomed in the intervening class meetings or in my office but not in class on the day that the homework is due. Late homework will be penalized by a deduction of 20% of the assigned grade for each schoolday -- including schooldays on which class does not meet -- that the work is late, so that, if the work is one week late, it will not receive any points. You may, however, still hand the work in so that you can benefit from corrections and be certain you know how to do a question that could well appear on an exam

Examinations 300 pts

There will be three in class exams worth 100 pts apiece, and lasting 50 minutes each.

Participation 50 pts

Participation points are easy to acquire and you probably already know how to get them; don't chat to your neighbors when I'm lecturing (asking a neighbor to help if you didn't understand what I said is, however, always acceptable). General politeness counts. Cheerfulness, engagement, willingness to push buttons on your calculator, asking me to clarify if you are stuck, taking advantage of my office hours, these are all, to quote the Sound of Music, a few of my favorite things.

Labs 150 pts

Cumulative Final Examination 200 pts

Total

800 pts

Attendance Policy:

You can afford to miss no more than the equivalent of one week of class. Any more absences are a dangerous loss of classtime percentage. Once you have had 3 **unexcused** absences, every unexcused absence from that point onward will incur a penalty of **10 pts** from your participation and attendance score. Make up exams situations will be considered on a case-by-case basis, but invariably they require as much forewarning as possible -- and documentation. You know when the exams are; please do not book flights home, or your wedding, etc, etc on those dates. If your, or your best friend's, or your uncle's hairdresser's poodle's (if you're from the Coast) wedding is already booked for any of those dates, please let me know ASAP. I will not give make up tests without good reason, and if you should miss a test that is not made up, your score for that test will be zero.

The sad fact is that it is a rare semester when some student doesn't have to rush home to tend a family crisis, or bury a loved one. Often this interferes with exams. Should such sadness happen to you, I will need to ask you for some sort of verification (obituary, hospital record, etc) and then we will try to get your semester moving again.

RESOURCES: Tutoring is available in the Learning Center - third floor, Murphy Center. The "drop in" times for Math 155 are

Tuesdays Thursdays 1 - 1:50 p.m.

I will expect you to make an appointment and see Beth Gaedy in the LC during the first 2 weeks of class and attend her presentation on succeeding in Mathematics. If you have already attended this presentation, you may chose to either attend this presentation again or attend one of the other presentations offered by the LC. She will inform me that you have done this, and I will give you full credit for Lab 0. I also want you to consider coming to see me if you have a problem with some material. Sometimes we can resolve in a few minutes a difficulty that can cause problems for weeks. I don't resent your coming -- it's part of my job! I want your success as much as you do.

FINAL COMMENTS: I believe firmly that you as the student are the learner, and that "to learn" is an active verb; you must be actively engaged in the learning process, and this is best accomplished by your **DOING** mathematics. I am not here to show you how much I know - I am here to be "a guide on the side, not a sage on the stage". Please feel free to ask questions in class, either of me or of your group-mates. Please feel free to come to my office to discuss problems you might be having. Please feel free to go visit the learning center for tutoring help if necessary. The bottom line is that you must take responsibility for your own learning. Please believe that "Mathematics is not a spectator sport!"

AMERICANS WITH DISABILITY ACT: If you are a person with a disability and require any auxiliary aids, services or other accommodations for this class, please see me and Jane Eddy, the disabilities coordinator (MC 332, 796-3194) within ten days to discuss your needs.

MATH 155 Fall 2010 Course Schedule

30 Aug Introduction

01 Sept **LAB 1 ELEUSIS**

03 Sept **LAB 2 POWER SEQUENCES**

06 Sept **Labor Day Break**

08 Sept <9.2>,<9.4>

10 Sept <9.3>,<9.5>

p351 #1-18

p352#19-28 all,35-49odd

13 Sept	Linear Growth	p487#1-10
15 Sept	Exponential Growth	p488#11-14
17 Sept	Logistic Growth	p488#15-24
20 Sept	REVIEW	
22 Sept	EXAM 1	
24 Sept	Preference Schedules and Plurality	p29#1-16
27 Sept	Borda Count and Plurality with Elimination	p32#17-34
29 Sept	Pairwise Comparisons and Rankings	p35#35-50
01 Oct	LAB 3 DEMOCRACY	
04 Oct	Banzhaf Power	p66#1-23odd
06 Oct	24 Sept Shapley Shubik Power	p68#25-45odd
08 Oct	Apportionment	
11 Oct	LAB 4 APPORTIONMENT	
13 Oct	Fair Division	p103#1-20 odd
15 Oct	Continuous Division Methods	p107#21-51odd
18 Oct	Discrete Division Methods	p114#53-69
20 Oct	REVIEW	
22 Oct	Mid Semester Break	
25 Oct	EXAM 2	
27 Oct	Euler Graphs	p193#17-49odd
29 Oct	TSPs	p230#29-56
01 Nov	TSPs Continued	continued
03 Nov	Minimal Networks	p267#19-26
05 Nov	Continued	p268#27-36
08 Nov	Scheduling	p309#17-57every other odd
10 Nov	LAB 5 DIGRAPHS	
12 Nov	Seven Rivers Undergraduate Research Symposium (Attending a session counts as Lab 00)	
15 Nov	Reflections and Rotations	p422#1-20
17 Nov	Translations and Glide Reflections	p425#21-34
19 Nov	Symmetry	p428#35-54
22 Nov	REVIEW	
24 Nov	Thanksgiving Break	
26 Nov	Thanksgiving Break	
29 Nov	EXAM 3	
01 Dec	Maps	
02 Dec	Maps	
03 Dec	Maps	
06 Dec	Maps	
08 Dec	Final Review	
10 Dec	Final Review	

Final Exam: Thursday, 16 Dec 2010, 7:40 – 9:40am