

MATH 155: Mathematics, A Way of Thinking

Spring 2009, 4 Credits, MWF 1:10 pm. R 1:00 pm, MRC 471

Instructor: Dr Michael Wodzak, Associate Professor of Mathematics

Office: MC 525, 796-3659;

Email: mawodzak@viterbo.edu

Hours: M—F 8—10, and by appointment

Final Exam: **Thursday 7th May 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 6th ed (Prentice-Hall, 2007)

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 400 pts

There will be four 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 900 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 are

Mondays - Fridays 9 - 9:50 a.m.

I will expect you to make an appointment and see Beth Gaedy in the LC during the first 2 weeks of class. She will let me know when you have done so and I will give you 25 ec points. At this meeting, she will discuss learning strategies and what the LC has to offer you.

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 Spring 2009 Course Schedule

12 Jan	Introduction	
14 Jan	LAB 1 ELEUSIS	
15 Jan	LAB 2 POWER SEQUENCES	
16 Jan	<9.1>,<9.3>	p329 #1-18
19 Jan	<9.2>,<9.4>	p331#19-28 all,35-49odd
21 Jan	Chapter 9 conclusion	
22 Jan	<10.2>	p364#1-1
23 Jan	<10.3>	p366#19-43odd

26 Jan	<10.4>	p367#45-58
28 Jan	Fractals	p434#1-53odd
29 Jan	Numeration Systems	Assigned Problems
30 Jan	Multibase Arithmetic	Assigned Problems
2 Feb	Number Theory	Assigned Problems
4 Feb	Humanities Symposium	
5 Feb	Number Theory Continued	Assigned Problems
6 Feb	REVIEW	
9 Feb	EXAM 1	
11 Feb	Preference Schedules and Plurality	p30#1-16
12 Feb	Borda Count and Plurality with Elimination	p32#17-34
13 Feb	Pairwise Comparisons and Rankings	p35#35-50
16 Feb	LAB 3 DEMOCRACY	
18 Feb	Banzhaf Power	p72#1-33odd
19 Feb	24 Sept Shapley Shubik Power	p74#23-45odd
20 Feb	Apportionment	
23 Feb	LAB 4 APPORTIONMENT	
25 Feb	Fair Division	p111#1-10
26 Feb	Continuous Division Methods	p113#11-49odd
27 Feb	Discrete Division Methods	p120#51-68
2 Mar – 6 Mar	Spring Break	
9 Mar	REVIEW	
11 Mar	EXAM 2	
12 Mar	Euler Graphs	p186#7-51eoo
13 Mar	TSPs	p223#29-56
16 Mar	Continued	continued
18 Mar	Minimal Networks	p260#19-26
19 Mar	Continued	p262#27-36
20 Mar	Scheduling	p303#17-57eoo
23 Mar	LAB 5 DIGRAPHS	
25 Mar	Reflections and Rotations	p394#1-20
26 Mar	Translations and Glide Reflections	p397#21-34
27 Mar	Symmetry	p400#35-54
30 Mar	Groups	assigned problems
1 Apr	Numerical Groups	assigned problems
2 Apr	REVIEW	
3 Apr	EXAM 3	
6 Apr	From this point in the semester there will be a number of labs and assigned work on tessellation and map colouring.	
8 Apr		
9 Apr – 13 Apr	Easter Holiday	
15 Apr		

16 Apr
17 Apr

20 Apr
22 Apr
23 Apr
24 Apr

27 Apr **REVIEW**
29 Apr **EXAM 4**
30 Apr **Final Review**
1 May **Final Review**

Final Exam: Thursday, 7 May 2009, 7:40 – 9:40 a.m.