

**AQUINAS COLLEGE**  
Department of Mathematics

The mission of the Mathematics Department at Aquinas College is directly linked to the mission of the College in that it provides a program for all students that is an essential part of a liberal arts education. It promotes the study of mathematics in depth in preparation for graduate school or an immediate career, supports the mathematical needs of other disciplines, and supplies a curriculum for all students to enhance their understanding of mathematical thought.

Through out this course, your work has to be your own. Your name on your graded work implies that you performed the calculations, figured out the steps, had an insight or accomplished other work yourself.

Aquinas College Mission Statement

Aquinas College is rooted in the Dominican traditions of prayer, study, community and service, combined with a deep respect for truth, honesty and integrity. In this spirit, we strive to create an environment in which integrity is prized and practiced. We expect all community members to uphold these values through honesty, fairness, and respect for others.

**SYLLABUS AND CALENDAR**  
MAT105 Math for Liberal Arts      Fall 2024

**Instructor:** Dr. Michael McDaniel  
AB50D    632-2147    mcdanmic@aquinas.edu  
Instructor's Schedule, Location/Times:

	<b>M</b>	<b>T</b>	<b>W</b>	<b>TH</b>	<b>F</b>
<b>9 - 12</b>	<b>MAT105 AB154</b>	<b>MAT105 AB154</b>	<b>MAT105 AB154</b>	<b>MAT105 AB154</b>	<b>MAT105 AB154</b>
<b>12:00 - 3:00</b>				<b>Office AB50D</b>	
<b>1:30-4:00</b>	<b>Office AB50D</b>				

**Textbooks and Instructional Materials**

Required Text: *Heart of Mathematics*, by Burger and Starbird, 4th edition. Colorless cover.

**Course Description**

This course will probably be the last time you will study math in your life. Since some of you will become people of influence, we take advantage of this last opportunity to show you why every college has a department of mathematics. We start with a difficult topic like the infinitude of primes or the different types of infinite sets and establish the ideas necessary for their careful examination. This happens in each chapter. So there is not an enormous build-up of concepts because each chapter stands alone. This course often has a title like *Survey of Mathematics* since it is exactly like an art or music survey course: we study complicated ideas from the rookie's point of view. Your success will depend on your ability to process complicated ideas. If math has been an obstacle, we are going to make math into a door this time. You are more sophisticated than you

were the last time you took a math class. You have the capacity to easily handle things which you found intimidating a few years ago. Here is an opportunity for success in an area which might have been annoying.

You get a 5 page hand-out on day 1 with ideas where we go beyond the book. Make sure to keep that handy!

Each class begins with a brief review. Then any questions from the students are considered. We will go over any assigned homework problems. You do your homework for yourself, not to be handed in. Then there will be a presentation of new ideas and a time for using those ideas. Any tests will occur in the last hour of class. The prof hands back graded work the next class. Quizzes happen when convenient.

### **Course Objectives**

1. We will work on chapters 1 - 10 of the text.
2. Students will gain a good understanding of problem-solving.
3. Students will find the factors of composite numbers, find prime numbers and use numerical properties to solve math problems.
4. Students will be able to count elements of sets, including infinite sets. They will be able to prove the difference between countable and uncountable sets.
5. Students will use arithmetic to explore bases other than 10 and modular arithmetic.
6. Students will use basic geometry to study various theorems and properties. Students will learn basic topological ideas to study surfaces and knots.
7. Students will learn the underlying structure of fractals well enough to create their own and find locations in the Mandelbrot set.
8. Students will use calculators to explore descriptive statistical topics.
9. Students will learn how to save money on mortgages and risk.

### **Methodology and Course Requirements**

Homework is the backbone of the class. Each meeting begins with questions about homework problems, then new ideas. Unprepared students often fumble in-class activities while prepared students succeed. These in-class activities count as quizzes. Please attend class, at the least, in order to do well on these quizzes.

The professor regards Zooming as worse than skipping because Zoomers seem to believe they actually went to class. Mostly, they turn off their camera and work on something else. A skipping student can't pretend they learned something. You chose to attend a college with face-to-face classes. Get your money's worth.

### **Assessment Tools Used and Criteria for Evaluation and Grading**

Graded work comes from quizzes, at least one per chapter and tests, exactly one per chapter.

Grade calculation:  $.3 \times (\text{quiz average}) + .5 \times (\text{test average}) + .2 \times (\text{final exam}) = \text{final grade}$ .

All grades are percentages. Tests and quizzes are corrected the next day. Letter grades are assigned by

70 through 72, C-      73 through 76, C      77 through 79, C+ and so on.

### **Accessibility Policy**

Aquinas College is committed to providing equal opportunity for participation in all programs, services and activities. If you need accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Requests for accommodations by persons with disabilities may be made by contacting the Accessibility (Disability) Services Office at 616-632-2177, [dsservices@aquinas.edu](mailto:dsservices@aquinas.edu). The office is located in the Wege Center, room 103C. Once your eligibility for an accommodation has been determined, you will be issued a verified letter from the Accessibility Services Office. Please present your accommodation letter to me as soon as possible in order to begin utilizing accommodations. Please note that accommodations are not retroactive.

### Academic Assistance

Academic Learning Services (616) 632-2166 offers free tutoring to all students. The instructor suggests you use office hours and the **free math tutoring** in AB50. The schedule is approximately MTWTH noon to 5pm in AB50.

Written or other work that a student submits must be the product of her/his own efforts. Plagiarism, cheating and other forms of academic dishonesty, including dishonesty involving computer technology, are prohibited. Further information on Academic Dishonesty can be found in the current College Catalog and in the Student Conduct Code. Work lifted off the internet, even when credited correctly, counts for nothing in this course.

MAT400 problems to do.		
Page 50	8, 10, 12, 15	number sense
Page 63	10, 12, 13	Fib
Page 81	9, 10, 16	primes
Page 93	10 – 14	mods
Page 110	3, 5	RSA
Page 121	6 – 9	irrationals
Page 134	7 – 11	rationals vs irrationals
Page 143	8, 9	one to one
Page 157	6, 7, 8, 12	countably infinite
Page 170	12, 14	Cantor's diagonal
Page 186 – 7	8, 10, 13, 14	power set
Page 200	2, 6, 7	geometric cardinality
Page 214	19, 12	Pythagorean theorem
Page 228	7	security camera
Page 244	8, 12	Golden rectangle
Page 285	11, 12	Platonics
Page 300	2 – 5	bent spaces
Page 318 – 9	6 – 8	slices
Page 336 – 7	7, 9, 11, 12	deformations
Page 351	8, 10	Mobius
Page 365	11, 14	knots
Page 381	7, 10	Brouwer fixed point

Page 396	4, 6, 7	edge paths
Page 409	7, 10	Euler Characteristic
Page 452 – 3	18, 19	vertex path
Page 519		give address of node in bottom picture
Page 540		top 2 cobwebs: loop, sink or spiral?
Page 586	12, 15, 16	probability coins, dice, cards
Page 606	32, 34	probability
Page 621	12, 13	lotteries
Page 638 – 9	15, 18	Nash equilibrium
Page 663	8, 13	bias
Page 687	9, 10	histograms
Page 706 – 8	4, 5, 9, 10	normal distribution
Page 728	8, 10	sampling
Page 754-5	12, 14, 15	linear regression
Page 771	12 – 14, 18	expected value
Page 790	10, 13	expected value with money
Page 823	5, 7	voting