Math 1012 Precalculus I: Functions (4 cr)

Session: MWF 2:15–3:20pm in Sci 3650
Instructor: Barry McQuarrie
Office: Science 1380 (by exit to parking lot behind science building)
Office Hours: Mon 3:30-4:30pm, Tue 9:00-11:00am, Wed 3:30-4:30pm, Fri 9:15-11:00am
Email: mcquarrb@morris.umn.edu (preferred communication) Phone: (320) 589–6302 (I do not use voicemail)
Course moodle site: https://ay15.moodle.umn.edu/course/view.php?id=481

Course Prerequisites: Placement beyond Basic Algebra

To succeed in this course you will need to have mastered basic algebraic manipulations (finding common denominator, solving simple linear and quadratic equations, factoring, sketching straight lines and quadratics, etc.) and be very comfortable and confident working with algebraic fractions. Historically, students who do not have these skills have not succeeded in this course.

Learning Objectives

This is a preparatory course for students who intend to take calculus. You should take calculus as soon as possible after completing this course, preferably the following semester. This course prepares you for Survey of Calculus; if you are planning to continue to Calculus I you may also wish to take Math 1013 Precalculus II: Trigonometry.

A detailed list of topics covered are at the end of the syllabus. A student who successfully completes this course should be able to

- manipulate functions algebraically and graphically,
- work with polynomial, power, rational, exponential, logistic, and logarithmic functions.

Beyond the curriculum, you should also expect to

- develop skill and confidence in problem solving,
- develop good study habits,
- develop an understanding of why the math works as it does, not just focus on memorizing techniques.

Time Commitment

University policy says "one credit is defined as equivalent to an average of three hours of learning effort per week (over a full semester) necessary for an average student to achieve an average grade in the course". Our course is a four-credit course, meeting approximately three hours per week: 4 credits times 3 hours/week/credit - 3 hours/week in lecture = 9 hours/week outside class. Thus, you are expected to spend 9 hours per week working outside of class, reading the textbook and working problems. You should set your sights higher than "average student, average grade", so expect to spend more than nine hours a week outside of class.

Please make the most of my office hours! The content of the course can be difficult at times and I expect to see you all in my office at some time or other. There are specific guidelines on how to spend your out-of-class time on the course moodle site, and I will hand them out on the first day.

Textbook

The required textbook is Dugopolski *Precalculus: Functions and Graphs* 4^{th} Ed–the bookstore will have this edition, and the course calendar is based on the 4^{th} Edition. The differences between the editions is usually minimal, but I have not used earlier editions of this text. If you use an earlier edition be aware that some of the sections may be numbered differently, content may be slightly different, and problems may not line up with your older edition.

Graphing Calculators

A graphing calculator could be useful for homework, but not required. Calculus at UMM is taught with the use of the computer algebra system *Mathematica*, therefore I will use *Mathematica* for any plots we do not create by hand. However, the focus will be on doing things by hand, without the use of a calculator/computer whenever possible. You will not be allowed to use a calculator on tests.

Course Components

The course is hosted on a moodle site, organized by week, and each day we typically cover a new topic. Read the documents *How I Grade* (moodle) and *Course Structure* (moodle and handout), which explains my expectation for how you will spend your time out of class and in class to master the material using the following components.

Class Periods. As I have provided my lecture notes on the course moodle site, class periods will be made up of a short lecture component, followed by time to work on homework and get individual assistance. For this to work effectively, you must come to class having completed the preparatory readings.

Practice. Practice questions will not be collected. Mastery of the topics we study will only come with practice, making homework beyond the graded WeBWorK and graded Homework a crucial component of our course. Every day when we cover a new section there are example problems with complete solutions available on the course moodle site. You should faithfully write out solutions to many of these ungraded homework problems! Although only a few practice questions are suggested for each lecture, you should do as many problems as needed to understand the day's topic.

Guided Examples. There are videos of me solving problems for many of the topics, so you can see the thought process that goes into the solution.

Textbook. The topic is also discussed in the textbook, and I direct you to the appropriate section. Please read the indicated sections of the text *before* the lecture. If you find reading the textbook difficult, stick with it–some sections we will not cover in as much detail, but it is good practice to be reading math, even if it is difficult.

Anticipation Guides. Anticipation Guides have been very effective in helping students deepen understanding and strengthen reading skills (even in mathematics, where the readings can be quite dense with information). Therefore, I will be providing Anticipation Guides for the readings. I will hand them out in class and you will complete them before you begin reading the next section. Anticipation Guides will not be graded, but I may ask to look at them at times during the semester.

WeBWorK. You will be completing some assignments using the online homework utility WeBWorK, which you can learn more about on the course moodle site. The WeBWorK problems are provided to give you practice implementing the computational techniques we will be studying, although occasionally a problem will be more theoretical in nature. WeBWorK is assigned by section, and typically contains 8-10 problems. If you do not start the WeBWorK early, you will have difficulty completing it!

Graded Homework. You will be submitting Graded Homework to questions I will hand out in class. The graded homework will be due at the beginning of the class following the class when the topic is discussed. I anticipate that you will start the graded homework before class and work on it during class.

It will be important to show your work, since the method of solution is just as important as the final answer. I will be looking for solutions as complete as what you have seen in the practice problems, the guided examples, and on the practice tests I will provide.

Tests. There will be four in-class Unit Tests and then a cumulative Final Exam. You will not be allowed any outside material on your desks during tests (no notes or calculators).

Grading Policy

The University utilizes plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following:

A	4.000	Represents achievement that is outstanding relative to the level necessary to meet course requirements
A−	3.667	
B+	3.333	
B	3.000	Represents achievement that is significantly above the level necessary to meet course requirements
B−	2.667	
C+	2.333	
C	2.000	Represents achievement that meets the course requirements in every respect
C−	1.667	
D+	1.333	
D	1.000	Represents achievement that is worthy of credit even though it fails to meet fully the course requirements
S		Represents achievement that is satisfactory, which is equivalent to a C- or better

The grade for the course will be calculated by the following formula (there is no extra credit):

Unit Tests (Sep 16, Oct 12, Nov 6, Nov 25)	40%
Graded Homework (almost every Mon,Wed,Fri at 2:15pm in class–see moodle for exact due dates)	20%
WeBWorK (almost every Tue,Thu,Sat at 6pm–see WeBWorK for exact due dates)	15%
Final Exam (Tue Dec 15 1:30-3:30pm Sci 3650)	25%

Your numerical grades will be converted to letter grades and finally Grade Points via the following cutoffs (grades are not rounded up):

Numerical	95.0%	90.0%	87.0%	83.0%	80.0%	77.0%	73.0%	70.0%	65.0%	60.0%	Below 60.0%
Letter	A	A−	B+	B	B−	C+	C	C−	D+	D	F
Grade Point	4.000	3.667	3.333	3.000	2.667	2.333	2.000	1.667	1.333	1.000	0.000

A Healthy Learning Environment

- **Attendance.** Attendance does not count towards your final grade, but missing class means you don't get the benefit of what we do in class, so please come to class and make sure to be in class on time. Neither I nor your fellow classmates enjoy the disruption late arrival causes. I know that situations crop up that will entail late arrival (please come even if you are late!) but try to ensure it is the exception and not the rule. Buy an alarm clock with a battery backup, as the power often goes out for a moment in Morris. If you are coming from another class and fear you may be late often, just let me know and don't stress about it. If you need to leave class early, let me know before class and slip out as unobtrusively as possible.

- **Computers/Cell Phones.** During class, cell phones and music devices should be turned off, and headphones removed from ears. If I find you are surfing the internet during class I will ask you to leave.
  http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html

- **Personal Conduct In Class and Online.** Be mindful of your peers around you, and keep stray chatter in class to a minimum. In the discussion forums and email communications, please consider the tone of your writing. We must maintain a respectful, open environment if we hope to have effective forum discussions. Also, make sure to use correct grammar, spelling, and punctuation in all your electronic communications. The UMM Student Conduct Code is available at http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf

- **Academic Dishonesty.** Cooperation is vital to your future success, which ever path you take. I encourage cooperation amongst students where ever possible, but the act of copying or other forms of cheating will not be tolerated. Academic dishonesty in any portion of the academic work for a course is grounds for awarding a grade of F or N for the entire course. Any act of plagiarism (presenting the ideas, words, or work of someone else as your own) that is detected will result in a mark of zero on the entire assignment or test. I will make it clear during class what is appropriate collaboration for each activity, but if you still have questions about what constitutes academic dishonesty, please come and talk to me. UMM's Academic Integrity policy and procedures can be found at www.morris.umn.edu/committees/scholastic/academicintegrity/.

  Academic Dishonesty FAQ: http://www.oscai.umn.edu/integrity/student/index.html

- **Appropriate Student Use of Class Notes and Course Materials.** Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes or other course materials beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. **Students may not distribute instructor-provided notes or other course materials, except to other members of the same class or with the express (written) consent of the instructor.** For additional information, please see:
  http://www.policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

- **Late Work/Missed Exams.** Since the assignments are handed out days in advance, only under exceptional circumstances (which can be officially documented) will I accept late work. You will receive a mark of zero if an assignment is submitted late. **However, please talk with me asap (do not wait until the next class) if you missed turning something in, even if it is after the deadline.** If an assignment is partially complete but you are not granted an extension, still submit the work you have completed so you can earn some partial credit. This is far preferable to earning zero on the assignment by not submitting anything.

  If you are going to miss a test (for a documented reason), let me know in advance so we can work out alternate plans. If you unexpectedly miss an exam/quiz/etc for a documentable reason, get in touch with me asap so we can work out alternate arrangements, or schedule a make-up.

  Assignments are due in class (come to class and turn them in). Slipping assignments into my mailbox or under my office door while I am teaching your course is **severely frowned upon** unless we have agreed that you will be doing this.

- **Your Health.** As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating, and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. If you have any special needs or requirements to help you succeed in the class, come and talk to me as soon as possible, or visit the appropriate University service yourself. You can learn more about the range of services available on campus by visiting the website:
  http://www.morris.umn.edu/academicalert/studentresources/

- **Disability Resource Center.** The University of Minnesota Morris is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

  If you have, or think you may have, a disability (e.g., mental health, attentional, learning, autism spectrum disorders, chronic health, traumatic brain injury and concussions, sensory, or physical), please contact DRC at 240 Briggs Library or call 320-589-6178 to arrange a confidential discussion regarding equitable access and reasonable accommodations.

- **Academic Alert.** I am strongly invested in making my best effort to ensure all my students (advisees, students in my classes, students I know through other avenues) have both a positive and productive experience at UMM.

  To this end, I use academic alert periodically throughout the semester to inform students when their academic performance in my class could be improved. These alerts are not a punishment, and not an indication of a student's ability to be successful in the class–they are meant to give the student and the student's advisor a heads up that there are some areas to work on which can help improve the student's mastery of the material.

  If you receive an academic alert from me, stop by my office (if you haven't already) to talk with me about your academic progress in the class to date, and we can discuss if there are opportunities or changes to your study practices that could help improve your understanding of the course material–and ultimately, of course, your grade!

Other Policies

- **Makeup Work for Legitimate Absenses.**
  http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html.
- **Student Conduct.**
  http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf
- **Sexual Harassment.**
  http://regents.umn.edu/sites/regents.umn.edu/files/policies/SexHarassment.pdf.
- **Equity, Diversity, Equal Opportunity, and Affirmative Action.**
  http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity_EO_AA.pdf.
- **Academic Freedom and Responsibility.**
  http://regents.umn.edu/sites/regents.umn.edu/files/policies/Academic_Freedom.pdf.

Topics

- B.1 Real Numbers and Their Properties
- B.2 Exponents and Radicals
- B.3 Polynomials
- B.4 Factoring Polynomials
- B.5 Rational Expressions
- 1.1 Equations in One Variable
- 1.2 Constructing Models to Solve Problems
- 1.3 Equations and Graphs in Two Variables
- 1.4 Linear Equations in Two Variables
- 1.6 Complex Numbers
- 1.7 Quadratic Equations
- 1.8 Linear and Absolute Value Inequalities
- 2.1 Functions
- 2.2 Graphs of Relations and Inverses
- 2.3 Families of Functions, Transformations, and Symmetry
- 2.4 Operations with Functions
- 2.5 Inverse Functions
- 2.6 Constructing Functions with Variation
- 3.1 Quadratic Functions and Inequalities
- 3.2 Zeros of Polynomial Functions
- 3.3 The Theory of Equations
- 3.4 Miscellaneous Equations
- 3.5 Graphs of Polynomial Functions
- 3.6 Rational Functions and Inequalities
- 4.1 Exponential Functions and Their Applications
- 4.2 Logarithmic Functions and Their Application
- 4.3 Rules of Logarithms
- 4.4 More Equations and Applications
- 8.1 Systems of Linear Equations in Two Variables
- 8.2 Systems of Linear Equations in Three Variables
- 8.3 Nonlinear Systems of Equations
- 8.5 Inequalities and Systems of Inequalities in Two Variables
- 10.1 The Parabola
- 10.2 The Ellipse and the Circle
- 10.3 The Hyperbola

Course UMM Campus Student Learning Outcomes (CSLO)

Knowledge of Human Cultures and the Physical and Natural World through:

- SLO-1a.(R) Core studies in the liberal arts: mathematics
- SLO-1b.(R) In-depth study in a particular field: its schools of thought, advanced theories, language, and methods of inquiry

Intellectual and Practical Skills, practiced extensively across students college experiences, including:

- SLO-2b.(R) Critical thinking and problem-solving
- SLO-2d-1.(I) Written
- SLO-2e.(R) Quantitative literacy

Capacity for integrative learning, including:

- SLO-4b.(R) Application of knowledge, skills, and responsibilities to new settings and progressively more complex problems
- SLO-4c.(R) Skills for sustained learning and personal development