

# MA291: Introduction to Higher Mathematics

Baker University — Spring 2023

MWF, 9:30 to 10:20 AM; Mulvane 409

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# 1 Instructor Information

Dr. Dylan C. Beck, Visiting Assistant Professor of Mathematics

- Discord: <https://discord.gg/Zg5tp36qtP> (Enroll here for assistance on homework.)
- email: Dylan.Beck@BakerU.edu (Capitalization is used for clarity.)
- Moodle: <https://bumoodle.bakeru.edu/course/view.php?id=36148>
- office: Boyd Science Center 328
- office hours: MWF, 2:30 to 3:20 PM; Tu, 12:30 to 3:20 PM; or by appointment
- pronouns: he / him / his
- textbook: *Mathematical Proofs: a Transition to Advanced Mathematics* (Fourth Edition) by Gary Chartrand, Albert D. Polimeni, and Ping Zhang
- virtual office: [Click to access my virtual office via Zoom.](#) (passcode: 044163)
- web page: <https://dylan-c-beck.github.io>

## 2 Course Information

### 2.1 Course Description

Per the course catalog, MA291 is a three credit-hour course on “basic notations, concepts, and proof techniques [...] in mathematics and computer science.” Explicitly, topics include “basic set theory, functions, relations, [...] mathematical induction, [...] graph theory, and combinatorics.”

### 2.2 Course Objectives

Proofs and logic in tandem with definitions form the basic language of mathematics and computer science. Our aim in MA291 is to develop a proficiency in the mechanics of mathematical writing and the art of mathematical proofs. By the end of the course, successful students will be able to

- work abstractly and concretely with sets, functions, and (equivalence) relations;
- convert written statements into symbols using logical quantifiers and connectives such as existence, uniqueness, universal, implication, negation, and biconditional;
- construct and interpret truth tables to discern when a statement is a tautology or a contradiction and to detect when two statements are logically equivalent to one another;
- use proof techniques such as direct proof, proof by contrapositive, proof by contradiction, and proof by mathematical induction to establish mathematical statements; and
- apply the techniques taught in the course to example problems in algebra, calculus, combinatorics, computer science, geometry, graph theory, and number theory.

## 2.3 Course Prerequisites

Enrolled students must have passed MA172 (Calculus II) with a grade of C or higher.

## 2.4 Course Policies

Class meetings will typically consist of an instructor-led lecture during which students will take notes, ask questions, and participate in discussion. Explicitly, lectures will feature materials from course notes that will be made available for students online and regularly maintained throughout the semester. Each Monday and Friday session, a short quiz will be administered at the end of class. Quizzes will contain a few questions pertaining to materials from an earlier class; students must be able to provide definitions, answer true-false questions, and compute examples.

Each student must submit their phone face-down on the table at the front of the room at the beginning of each class period, and the device must be left there for the duration of the meeting (barring extenuating circumstances that merit phone usage). Failure to comply with this policy will result in a deduction of one-tenth of a percentage point from the student's overall grade.

Regular and punctual attendance is vital to understanding the information presented in this course; however, in the event that an absence cannot be avoided, it is the responsibility of the student to inform the instructor by filling out the [Excused Absence Request Form](#) and to make arrangements with the instructor to make up any materials or assignments missed during class.

Unless otherwise specified, the instructor requires that students wear masks in the classroom. We will adhere to [Baker University guidance](#) on other matters pertaining to COVID-19.

## 2.5 Coursework, Exams, and Quizzes

Each week, written homework will be assigned at the instructor's discretion. Unless otherwise specified, written assignments are due at the end of class two weeks from the date they are assigned. Consult the [course schedule](#) for the specific due dates. Late work may not be accepted unless proper documentation is provided; however, if a student anticipates an absence and communicates it to the instructor prior to the due date of an assignment, the student may be allowed to submit their work even after the due date with no deduction in points.

Every Monday and Friday class period of the semester, a brief quiz will be administered in the last five to ten minutes of the session. Unless otherwise specified, quizzes will contain one or two definitions, one or two true-false questions, and one or two computational questions related to the material that was covered in class during an earlier course meeting.

Exams will be administered four times throughout the semester. Like with the daily quizzes, students will answer true-false questions, compute examples, and provide definitions; however, students must also write some proofs on exams. Credit for definitions and true-false questions is administered to the student on an all-or-nothing basis. On the other hand, credit for computations and proofs is earned by the student primarily through citing theorems, demonstrating a command of appropriate proof techniques, and showing work: when the relevant work is shown and a problem is answered correctly, full credit will be awarded. Partial credit may be awarded when it is obvious that a problem was attempted and some pertinent details were supplied.

Before quizzes and exams, students must demonstrate that their work spaces are compliant with the regulations and guidelines set out by the instructor. Explicitly, a student is only allowed a writing utensil and a scientific calculator on their desk; other papers and electronic devices must be stored in the student's backpack and placed under or next to their desk. Once all

students have cleared their work spaces, the assessment will begin, at which time each student will have five minutes to complete the quiz (50 minutes for exams). Once a student has finished the exam (or time has expired), the check-out procedure is initiated by the student bringing their work to the instructor; if desired, the student may subsequently leave class for the day.

## 2.6 Student Expectations

Communication between students and the instructor will occur primarily in the classroom and during the instructor's (virtual) office hours; however, each student should check their email and [our course Moodle](#) for course updates and supplementary materials.

Collaboration with classmates on homework is encouraged; however, each student is expected to submit their own work on all assignments, and each student will be graded on their own work as it appears. Consequently, for students working together, it is critical that no party completes any work on behalf of another party and moreover that each party determines their own solutions. Explicitly, students should write original proofs rather than copy from one another; however, students may discuss different techniques or strategies leading to a possible proof. Ultimately, students must clearly indicate their collaborators for each assignment (see Section 3 below).

Outside of class, students should expect to spend (at least) two hours preparing materials and studying for every hour spent in class (see Section 5 below). Unlike in high school, students that do not understand the material covered should not assume that their instructor will repeat material until it is understood and mastered; rather, each student is expected and encouraged to ask questions as they occur in class. Certainly, all students should devote time to studying course materials outside of class, but if that does not work, students should consider visiting the instructor during his office hours. Do not hesitate to ask questions, as this course is cumulative.

## 2.7 Grade Distribution

Below is a table with the distribution of grades for this course.

<i>type</i>	<i>quantity</i>	<i>weight</i>	<i>total</i>
exams	3	15%	45%
final exam	1	25%	25%
homework	7	2%	10%
quizzes	22	1%	20%

We will use the traditional grading scale (e.g., an A is  $\geq 90\%$ ; a B is  $\geq 80\%$  and  $< 90\%$ ; etc.). Each student that completes all homework assignments with a homework average of at least 67% will be allowed to drop their lowest two homework scores. Each student that completes all quizzes with a quiz average of at least 67% will be allowed to drop their lowest two quiz scores.

## 2.8 Final Exam

Our final exam will be administered on **Monday, May 15** from **8:00 to 11:00 AM** in Mulvane 409. Each of the three sections we cover will account for roughly 33% of the exam material.

### 3 Academic Misconduct Policy

Per the official Baker University guidelines, “students [are expected] to have solely completed or prepared the work or research that bears their name and to acknowledge the materials and sources of others; [...] to do their own work and research; to prepare their own reports and papers; and to take examinations without the assistance of others or aids not allowed in the testing procedure.” Even more, Baker University holds that “academic misconduct includes but is not confined to plagiarizing; cheating on tests or examinations; turning in counterfeit reports, tests, and papers; stealing of tests and other academic material; knowingly falsifying academic records or documents; and turning in the same work to more than one class without informing the instructors involved.” Each of the aforementioned terms are in turn defined as follows.

- “Cheating includes possession, use, or receipt of unauthorized aids or assistance. Notes, charts, books, and mechanical devices used in a quiz, test, or examination, but not specifically allowed by the examiner, constitutes cheating. Visually or verbally receiving or giving information during a quiz, test, or examination that is not specifically allowed by the examiner is also cheating.” Cheating may benefit one’s self or one’s neighbor.
- “Counterfeit work includes work submitted as one’s own that was created, researched, or produced by someone else. Submission of the work of another person, joint work as if that work was solely one’s own, or production of work to be submitted in the name of another person are all forms of counterfeit work.” Be sure to clearly indicate the names of any and all collaborators on any assignment that is not completed solely on one’s own.
- “Plagiarism includes presenting as one’s own efforts the work of someone else without proper acknowledgment of that source. It is not enough to copy the work of someone else and provide a citation. Exact copying must be enclosed in quotation marks or properly blocked with an appropriate citation of its origin. Failure to cite paraphrasing in which the basic sentence structure, phraseology, and unique language remain the same constitutes plagiarism as well as failure to acknowledge unique, unusual, or new ideas or facts not the product of one’s own investigation or creativity. It is the student’s responsibility to understand what constitutes plagiarism and how to properly paraphrase and cite sources. When in doubt, it is the student’s responsibility to seek guidance from the instructor.”

If a student engages in academic misconduct, it will be documented by the instructor and the student’s grade will be reduced or an XF will be appended to the student’s academic transcript, in accordance with and as permitted by Baker University. Consequently, the instructor urges that students become familiar with the academic misconduct policy from the [student handbook](#).

### 4 Accommodations Policy

Per the official Baker University guidelines, “Baker University is committed to providing ‘reasonable accommodations’ in keeping with Section 504 of the Rehabilitation Act and the Americans with Disability Act of 1992. Students must provide appropriate documentation of the disability, which should include appropriate diagnostic testing and a recommendation form prepared by qualified personnel outside of Baker University. ‘Reasonable accommodations’ will be determined by university staff in consultation with the student, faculty, and / or staff member. Accommodations are not retroactive.” Further information is provided [here](#) and [here](#).

## 5 Credit Hour Definition

Baker University adheres to the federal definition of a credit hour as “an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates not less than (1.) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester [...] hour of credit [...]; or (2.) at least an equivalent amount of work as required in [the first] definition for other academic activities as established by the institution, including laboratory work, internships, practica, studio work, distance learning, and other academic work leading to the award of credit hours.” Courses at Baker University are typically 50 minutes in duration. Further information is provided [here](#).

## 6 Update Clause

Ultimately, the instructor reserves the right to alter or update this syllabus in order to reflect changes in policy or schedule due to extenuating or otherwise unforeseen circumstances. Consequently, it is the responsibility of the students to remain up-to-date with this syllabus; however, the instructor will inform students of any such changes to this document, and the syllabus will be maintained and subsequently updated on the instructor’s web page for the students’ convenience.