MA281: Introduction to Linear Algebra

Baker University — Fall 2023

MWF, 2:30 to 3:20 PM; TBD
Tu, 12:30 to 1:40 PM; TBD

Contents

1 Instructor Information

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

- <u>Discord</u>: `https://discord.gg/ZPUeyAcVHM` (Enroll here for assistance on homework.)

- <u>email</u>: Dylan.Beck@BakerU.edu (Capitalization is used for clarity.)

- <u>Moodle</u>: `https://bumoodle.bakeru.edu/course/view.php?id=37445`

- <u>office</u>: Boyd Science Center 328

- <u>office hours</u>: MWF, 9:30 to 10 AM; 10:30 to 11 AM; 3:30 to 4 PM; Tu, 10:30 to 11 AM; 11:30 AM to 12 PM; 2:30 to 3 PM; 3:30 to 4 PM; or by appointment

- <u>pronouns</u>: he / him / his

- <u>textbook</u>: *Linear Algebra* (Third Edition) by John B. Fraleigh and Raymond A. Beauregard

- <u>virtual office</u>: Click to access my virtual office via Zoom. (passcode: 044163)

- <u>web page</u>: `https://dylan-c-beck.github.io`

2 Course Information

2.1 Course Description

Per the course catalog, MA281 is a four credit-hour course on "systems of linear equations, vector spaces, matrices, determinants, [...] diagonal form[s], eigenvalues, and geometric applications."

2.2 Course Objectives

Because of its ubiquity in both applied fields such as mathematical physics and numerical analysis and pure fields like mathematical analysis and modern algebra, linear algebra is a fundamental tool in contemporary mathematics. By the end of the course, successful students will be able to

- convert real systems of linear equations into real matrices and solve (if possible);

- compute bases and find eigenvalues and eigenvectors of linear transformations of real vector spaces such as real n-space, real $n \times n$ matrices, and real polynomials of degree at most n;

- compute the minimal polynomial and characteristic polynomial of a real $n \times n$ matrix; and

- compute the Smith Normal Form of the characteristic matrix and use it to determine the Rational Canonical Form and Jordan Canonical Form of a real $n \times n$ matrix.

2.3 Course Prerequisites

Enrolled students must have passed MA172 (Calculus II) with a grade of C or higher. Calculus concepts such as derivatives, definite integrals, and infinite series may be discussed in this class. Even more, students should have some familiarity with scientific writing and the language of mathematical proofs. Over the course of the semester, we will work to further hone these skills.

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. Every Monday and Friday, typically, a brief quiz will be administered at the end of class. Quizzes will contain no more than ten questions pertaining to materials introduced in a previous class meeting. Explicitly, students must be able to provide definitions of key terms, answer true-false questions, and compute some examples. Every Tuesday, following the lecture as time allows, students will be afforded time to work on assignments, ask questions in class, and discuss course concepts with their colleagues.

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 a quarter 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 of an unavoidable absence, 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.

Even more, in view of the instructor's obligation to provide timely feedback on assignments, unless granted explicit permission from the instructor, students may not submit work more than 48 hours past the due date; toward this end, the instructor reserves the right to deny any student of comments or credit on any assignment submitted 48 hours past the due date. Crucially, unless granted explicit permission from the instructor, it remains the responsibility of any student that misses class (due to illness or extenuating circumstances) to submit their homework on time.

Conversely, the instructor reserves the right to deny any student of comments or feedback on any assignment submitted in advance of the due date. Explicitly, the instructor may refuse to review, revise, or otherwise provide assistance on an assignment outside of office hours.

2.5   Coursework, Exams, and Quizzes

Each week, at the instructor's discretion, pertinent written homework will be issued. Unless otherwise specified, written assignments will typically be distributed in class on Tuesday and subsequently collected at the beginning of class on Friday the week after they were assigned. Consult the course schedule for specific due dates. Late work may not be accepted unless proper documentation is provided; however, if a student anticipates and communicates an issue 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 (refer to the policy in Section 2.4).

Every Monday and Friday of the semester (other than holidays), a brief quiz will be administered in the last ten minutes of the class meeting. Unless otherwise specified, quiz questions will include definitions of key terms, true-false statements, and computational short response related to the material that was covered in class during an earlier course meeting.

Exams will be conducted four times throughout the semester. Like on the quizzes, students will evaluate true-false questions and compute examples; however, students may also encounter multiple choice or short proofs on the exams. Credit for true-false and multiple choice 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 following regulations and guidelines set out by the instructor. Explicitly, during a quiz or exam, students are only allowed a writing utensil and a non-graphing, non-programmable scientific calculator without computer algebra capabilities 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 ten minutes to complete the quiz (or 50 minutes for exams). Once a student has finished (or time has expired), the check-out procedure is initiated by the student bringing their work to the instructor; if desired, the student may then leave class for the day.

Below is a brief list of authorized calculators for use on quizzes and exams in MA372.

- TI-30XIIS
- TI-34
- TI-30XA
- Casio fx-300ESPLUS

2.6   Discord

Considering that it may be difficult for some students to attend weekly office hours, the instructor may elect to maintain a Discord server where individuals may reach out for homework assistance, ask questions regarding course policies or assignment due dates, and discuss course material with their colleagues and the instructor. Crucially, engagement on Discord is optional: explicitly,

- participation on Discord is not required as part of the MA281 coursework;
- interactions on Discord will not influence a student's grade in the course; and
- Discord should not be viewed an official medium of communication between the instructor and the students at Baker University. Explicitly, Baker email remains the official mode of communication between the students at Baker University and their instructor.

Even more, students are not permitted to directly message the instructor via Discord, and any comments made by students on Discord may be viewed by their colleagues. Bearing this in mind, it cannot be understated that confidential information must not be shared on Discord. Critically, the instructor is obligated according to official Baker University policy to report any "illegal, unethical, or improper activities" on the Discord server to the appropriate authorities.

2.7   Communication and 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 Baker email and Moodle regularly for course updates and supplementary materials. Even more, students are encouraged to join the MA281 Discord for additional help on assignments.

Generally, the instructor will adhere to Baker University's Hours of Operation as it pertains to attending office hours, conducting make-up exams, and responding to emails or other correspondence from students; therefore, students should be conscientious and cognizant of this time frame when seeking assistance with assignments or scheduling appointments with the instructor. Even more, the instructor reserves the right at least 24 hours to respond to any correspondence sent during the business week (Monday through Friday, excluding holidays) or more on weekends.

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 solutions rather than copy from one another; however, students may discuss different techniques or strategies leading to a possible solution. Ultimately, students must clearly indicate their collaborators for each assignment (refer to Section 3).

Outside of class, students should expect to spend (at least) two hours preparing materials and studying for every hour spent in class (refer to Section 5). 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.

Crucially, it should be duly noted that the instructor reserves the right to refuse any accommodations requested by a student after the last day of classes of the semester — especially if the aforementioned arrangements are negotiated in an attempt to improve the student's overall grade or to achieve a desired mark in the class. Consequently, it is absolutely imperative that students reach out early and often to communicate to the instructor any difficulty or apprehension.

2.8 Grade Distribution

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

type	quantity	weight	total
exam	3	15%	45%
final exam	1	30%	30%
group work	8	1.25%	10%
quiz	20	0.75%	15%

Below is a table with the projected grading scale used for this course.

grade	minimum	maximum
A	90%	100%
B	80%	89.99%
C	70%	79.99%
D	60%	69.99%
F	0%	59.99%

Each student that completes all homework assignments with an average homework score of at least 67% may elect to drop their lowest two homework scores. Each student that completes all quizzes with an average quiz score of at least 67% may elect to drop their lowest two quiz scores.

2.9 Final Exam

Our final exam will be administered on **DAY OF WEEK, December DATE** from **TIME to TIME** in LOCATION. Each of the three sections we cover will account for roughly 33% of the exam material.

3 Academic Misconduct Policy

Per the Academic Misconduct Policy of Baker University, "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 these aforementioned terms are in turn defined as follows.

- "Cheating includes possession, use, or receipt of unauthorized aids or assistance," hence "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." Consequently, in order to avoid charges of academic misconduct, it is imperative that students 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 Access Services Policies and Procedures, "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 in the ADA Policy.

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 at any point in the semester to alter this syllabus to reflect changes in policy or schedule due to extenuating or 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.