Linear Algebra - MTH 42, Sec. D01

Professor: Dr. Luis Fernández
Class times and room: Mo, We, 10:00 to 11:50 at CP 305.
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Overview of the course.

Linear algebra is one of the most important tools in all of the sciences and mathematics. It appears in optimization, differential equations, web-searching algorithms, finance, criptograpy, population growth, AI. . . You name it. This course aims to give an working understanding of linear algebra **It is important that you master these tools as you will need them in your future studies.** The main topics that we will cover are:

- Systems of linear equations. Vectors in Euclidean space. Matrices and operations. Subspaces of Euclidean space. Determinants. Diagonalization. Vector spaces in general. Linear transformations.

Some resources:

- **Classes:** Attendance is essential to succeed in the class. In class you will have time to learn new material, practice, and ask questions.
- **Math Tutorial Lab:** In the Math Tutorial Lab you will find permanent tutors for all math courses. It is located at CP 305 and opens 10–17 Monday to Thursday, 10–20 Friday, and 10–15 Saturday and Sunday.
- **Meetings with the instructor:** If you need help, or for any other matters concerning the course, you can talk to me during office hours or at other time we arrange.
- **Email:** If you have questions while doing homework and need help quickly, please email me anytime (address above).
- **Computer algebra programs:** Students are strongly encouraged to use computer algebra programs (the university has Mathematica; there are also many resources online) in this class. Use them to be able to do examples quickly, once you have learned to do everything by hand.

Textbook:

- *Elementary Linear Algebra (Applications Version), 11$^{\text{th}}$ Ed.*, by H. Anton, C. Rorres. You need to have to book. You can find it online new or used at a good price.

Student's responsibilities

- To use the **resources** available (some are above) to attain the main goal: to learn.
- To **prepare** each class by studying the material in the previous class, solving the recommended exercises and reading ahead in the text.
- To work on many **exercises**, as it is impossible to learn mathematics without doing so. The main purpose of the exercises is not quite to find the answer, but to learn from them. Therefore, if you work in an exercise for a long time without finding a correct answer, do not feel frustrated, instead consider how much you have learned in the process.
- To **ask** questions during classs or tutorials about anything that has not been understood. EVEN IF YOU THINK THAT YOUR QUESTION IS TOO TRIVIAL, I GUARANTEE THAT MANY OTHER STUDENTS WILL BENEFIT FROM THE ANSWER. So when in doubt do your classmates a favor and ASK!

Instructor's responsibilities

- To act as *facilitator* of the learning process of the students, and to assist with any question that students may have about the material.
- To give tests and exams of appropriate difficulty. To grade tests and exams promptly and explain the students the meaning of their grades.

Some Rules

- Cell phones, music devices and laptops are not allowed during class time.
- Tests will not be repeated. The only exception, in some situations, is if the instructor receives notice of the absence (via e-mail or telephone) **on or before the day of the test or quiz**.

Exams and homeworks:

- There will be a **midterm exam**, worth **30%** of the final grade.
- **Weekly homework** will be done via WebWork. It counts **15%**.
- **Project and quizzes** will count **15%**. They will be announced in class.
- The **final exam** will count **40%** of the final grade.

Class plan and assigned exercises. MTH 42. Professor Luis Fernández

Use this to prepare each class in advance. Note that dates may change depending on how fast we advance.

Date	Section	Exercises from text	WebWork
	Chapter 1. Linear Equations.		
We 8/27	**1.1.** Introduction to systems of linear equations	2, 3, 5, 8, 9, 13, 15, 20	**HW 1**
Mo 9/1	NO CLASS - LABOR DAY		
We 9/3	**1.2.** Gaussian elimination	1-7, 15-19, 21, 25, 27, 29, 37	**HW 2**
Mo 9/8	**1.3.** Matrices and matrix operations	1, 3, 5, 6, 7, 11, 12, 15, 16, 23, 25, 27-30	**HW 3**
We 9/10	**1.4.** Inverses and rules of matrix arithmetic	1, 2, 3, 5, 6, 7, 10, 12, 14, 18, 35, 36, 37	**HW 4**
Mo 9/15	**1.5.** Elementary matrices and a method for finding A^{-1}	1 - 6, 9, 13, 15, 17, 19, 20	**HW 5**
We 9/17	**1.6.** Further results on systems of equations, invertibility	1, 3, 5, 10, 12, 13, 15, 18	**HW 6**
Mo 9/22	NO CLASS		
We 9/24	NO CLASS		
Mo 9/29	**2.1.** Determinants by cofactor expansion	1-4, 19, 25, 29, 38	**HW 7**
We 10/1	NO CLASS		
Mo 10/6	**2.2.** Evaluating determinants by row reduction	1, 3, 5, 7, 8, 10, 13, 14, 17, 19, 22, 23	**HW 8**
We 10/8	**2.3.** Properties of the determinant function	5, 7, 9, 14, 15, 17	**HW 9**
Mo 10/13	NO CLASS - COLUMBUS DAY		
Tu 10/14	**4.1.** Real vector spaces	3-14	**HW 10**
We 10/15	**Midterm Exam**		
Mo 10/20	NO CLASS		
We 10/22	**4.2.** Subspaces	1-5, 7-12, 17	**HW 11**
Mo 10/27	**4.3.** Linear independence	1-4, 7, 9, 10, 15	**HW 12**
We 10/29	**4.4.** Coordinates and basis	1-5, 7, 7-11, 16, 17, 20	**HW 13**
Mo 11/3	**4.5.** Dimension	1, 3, 4, 8, 9, 12, 14, 22, 27	**HW 14**
We 11/5	**4.6.** Change of basis	1-3, 6-8, 9	**HW 15**
Mo 11/10	**4.7.** Row space, column space, and null space	1, 3, 5, 8, 9, 14, 16, 24	**HW 16**
We 11/12	**4.8.** Rank and nullity	1-6, 9, 15, 18, 19, 27	**HW 17**
Mo 11/17	**4.9.** Matrix transformations from $\mathbb{R}^2$ to $\mathbb{R}^3$ ($\mathbb{R}^n$ to $\mathbb{R}^m$)	1, 3, 5, 7, 8, 14-16	**HW 18**
We 11/19	**4.1.** Properties of matrix transformations	5, 10, 11, 13	**HW 19**
Mo 11/24	**5.1.** Eigenvalues and eigenvectors	1-6, 21, 24, 28, 29	**HW 20**
We 11/26	**5.2.** Diagonalization	3, 5, 9,11, 14,15, 17, 20, 21, 35	**HW 21**
Mo 12/1	**8.1.** General linear transformations	1, 3, 5, 11, 14, 20, 21, 23, 25, 30	**HW 22**
We 12/3	**8.2.** Composition and inverse linear transformations	1, 2, 3, 5, 11, 14, 17,	**HW 23**
Mo 12/8	**8.3.** Isomorphism	1-11, 17, 19	**HW 24**
We 12/10	**8.4.** Matrices of general linear transformations	1, 3, 6, 7, 9, 10, 14, 17	**HW 25**
Mo 12/15	**8.5.** Similarity	1, 3, 6, 7, 9, 11, 14, 22	**HW 26**
Mo 12/22	**Final Exam.** (Date to be confirmed.)		

REMEMBER: The exercises listed correspond to the material that will be covered on the date they are listed.

Academic Integrity:

Academic dishonesty (such as plagiarism and cheating) is prohibited at Bronx Community College and is punishable by penalties, including failing grades, dismissal and expulsion. For additional information and the full policy on Academic Integrity, please consult the BCC College Catalog.

Accommodations/Disabilities:

Bronx Community College respects and welcomes students of all backgrounds and abilities. In the event you encounter any barrier(s) to full participation in this course due to the impact of a disability, please contact the disAbility Services Office as soon as possible this semester. The disAbility Services specialists will meet with you to discuss the barriers you are experiencing and explain the eligibility process for establishing academic accommodations for this course. You can reach the disAbility Services Office at: disability.services@bcc.cuny.edu, Loew Hall, Room 211, (718) 289-5874.