MATH_V 221 921 2025SS Matrix Algebra

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MATH 221, SUMMER TERM 1 - May June 2025.

WHEN:

Mon Thu Fri : 2:00 p.m. - 4:00 p.m.

Wed : 2:00 p.m. - 3:00 p.m.

WHERE:

BUCH-Floor 1-Room A101

INSTRUCTOR:

Rachel Ollivier. Please email me via Canvas.

TA: will be announced later

BOOK:

https://personal.math.ubc.ca/~tbjw/ila (https://personal.math.ubc.ca/~tbjw/ila)

PIAZZA: please use the link on the left hand side of this Canvas website.

HOMEWORK:

Online homework for the course will be provided via the WeBWorK system. You can find this system via Canvas. Note however that the course website may not be active before the first few days of classes.

There will be one assignment posted per week, each due on the following week, as per the course schedule. Questions about the HW or the online system may be addressed to either your instructor or to the course TA.

Please note the following items:
(1) You may attempt each question as often as you like until you solve the problem. There is no penalty for a wrong answer. This is to help you correct your own mistakes, and to get instant feedback on your attempts.
(2) The questions are generated randomly, and the numbers are different for each student.
(3) Please try to do the problems by yourself, and without the use of other calulators or software. Since calculators and software are not allowed in the exams, you should practice working without them.
(4) If you really get stuck, you can request help by clicking the email instructor button. However,

it may take some time to get a response, so please dont wait till the last minute.
(5) In general, it is a good idea to start the assignments early rather than waiting till the last minute. The deadlines are enforced by the system, and it will shut down automatically when time is up, so give yourself plenty of extra time in case of problems.
(6) Since the deadlines are enforced by the system, there is no extension for the homework.

TESTS:

Tests: There will be two midterm exams (in class) and a final exam. The tests will be closed book-closed notes tests. Calculators will not be allowed.

DATES OF THE MIDTERMS : May 28 and June 11 (in class)

GRADES:

Note that the lowest HW score will be dropped to compute your HW grade. Grades will be automatically computed as the maximum of the following:

• Homework 10%, Midterms 20%+20%, Final exam 50% or
• Homework 10%, Best midterm score 20%, Final exam 70%.

For example, the grades of those students who miss a midterm will be computed by the second method.

SYNOPSIS:

The course will cover more or less the whole book (with some minor exceptions).
Linear algebra is a fundamental and extremely important topic in mathematics. In fact, many other areas attempt to reduce more complicated questions to problems in linear algebra. For example, calculus tries to reduce questions about curves and surfaces (or higher dimensional shapes) to ones about their tangent lines or tangent planes. These lines and planes are concepts in linear algebra. Perhaps another way of saying this is that the derivative, the key concept in calculus, is a linear map. This course is a study of linear maps. We will learn what they are, how to manipulate them as well as tools (determinants, eigenvectors/eigenvalues, diagonalization) to better visualize them. Along the way we will also touch on various applications.

SCHEDULE:

Here is a rough course schedule, subject to later adjustments.
•Week 1.
§1.1,1.2: Vectors, Vector Equations and Spans

§2.1-2.4: Systems of Linear Equations, Row reduction, Parametric Form, Matrix Equations,

•Week 2.

§3.1-3.2: Solution Sets, Linear Independence

§3.3-3.6: Subspaces, Basis and Dimension, Bases as Coordinate Systems, The Rank Theorem

•Week 3.

§4.1-4.2: , Matrix Transformations, One-to-one Transformations

§4.2-4.4: Onto Transformations, Linear Transformations, Matrix Multiplication

•Week 4.

§4.5-4.6: , Matrix Inverses, the Invertible Matrix Theorem

§5.1-5.3: Determinants: Definition, Cofactor Expansions, Determinants and Volumes

•Week 5.

§6.1-6.4: Eigenvalues, Eigenvectors, the Characteristic Polynomial, Similarity, Diagonalization

§6.4-6.6: Diagonalization, Complex Eigenvalues, Discrete Dynamical Systems

•Week 6.

§7.1-7.3: Dot Products, Orthogonality, Orthogonal Complements, Orthogonal Projection

§7.4-7.5: Orthogonal Sets, Gram-Schmidt Process, The Method of Least Squares

Course Summary:

Date	Details	Due