LINEAR SYSTEMS, MATH 152
JANUARY-APRIL, 2025

1. General Information

- Course: Math 152 (Linear Systems), 2024W Term 2.

Homework: Online homework for the course will be provided via the WeBWorK system (which should be accessible through Canvas). There will be one assignment posted per week, each due the following week, as per the course schedule. The lowest score will be dropped.

Please note the following items:

(1) You may attempt each question more than once. 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, its 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.

Matlab: Matlab assignments for the course will be available for download from Canvas, with solutions uploaded to Canvas. These will be posted every other week with the lowest score dropped.

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.

Grades: Grades will be computed as the maximum of the following:

- Homework 10%, Matlab assignments 10%, Midterms 15%+15%, Final exam 50% or
- Homework 10%, Matlab assignments 10%, Best midterm score 15%, Final exam 65%.

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

Synopsis: Linear algebra is a fundamental and extremely important topic in mathematics. This is in part because 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.

Help Rooms: The Math Learning Centre schedule will be available on-line at
$$\texttt{http://www.math.ubc.ca/~MLC/}$$

2. Schedule

Here is a rough course schedule, subject to later adjustments.
- Week 1. §2.1-2.3: vectors and coordinate representation; vector length
- Week 2. §2.3-2.5: dot product, projection; determinants; cross product; lines in 2D, lines and planes in 3D
- Week 3. §2.5,2.6: lines and planes; geometry of solutions of linear systems; linear dependence and independence;
- Week 4. §3.1-3.3: solving linear systems; echelon form, reduced row echelon form, rank; homogeneous equations
- Week 5. §3.3-3.5: homogeneous systems; geometric applications; resistor networks
- Week 6. §4.1-4.2: matrix multiplication; linear transformations
- Week 7. §4.2-4.4: rotations, projections and reflections in 2D; matrix representation and composition of linear transformations; random walks
- Week 8. §4.3-4.6: random walks; transpose; matrix inverse; determinants
- Week 9. §4.6,5.1-5.4: determinants; complex numbers; complex exponential and polar form
- Week 10. §6.1: eigenvalues and eigenvectors
- Week 11. §6.1-6.2: eigenvalues and eigenvectors; powers of a matrix; application to random walks
- Week 12. §6.3-6.4: vector differential equations; application to electrical networks
- Week 13. Loose ends and review

3. Official statement about the Universitys values and policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here:
$$\texttt{https://senate.ubc.ca/policies-resources-support-student-success}$$