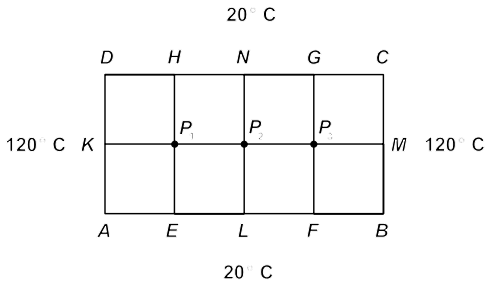
MATHEMATICS 2050
LINEAR ALGEBRA I

Linear algebra originated with the study of linear equations, and the subject of linear equations is still of major importance in all disciplines that make use of mathematics. Not only does linear algebra provide a basic framework and language for the study of many areas of mathematics, but, in addition, many problems in engineering and the physical and social sciences are treated using concepts studied in linear algebra.

For example, consider the elementary physics problem of determining the equilibrium temperatures t_1, t_2 and t_3 at the interior points P_1, P_2 and P_3 of a thin rectangular plate with corners A,B,C,D where the top and bottom are kept at 20°C and the sides kept at 120°C.



Of course, there is a practical problem in maintaining these temperatures near the corners, but if we assume this problem has been overcome, then using the *heat conduction law* of physics, which says that at equilibrium, the temperature at any interior point P is the average of the temperatures at the four neighbouring points, it is a simple matter to show that the task of finding t_1, t_2 and t_3 is reduced to solving the system

$$\begin{aligned} 4t_1 - t_2 &= 160 \\ t_1 - 4t_2 + t_3 &= -40 \\ t_2 - 4t_3 &= -160 \end{aligned}$$

of three linear equations in three unknowns. In Mathematics 2050, an introductory linear algebra course, we learn systematic ways to solve this and more general systems of linear equations. Other major topics covered include vectors, matrices, factorization of matrices, determinants, eigenvalues and eigenvectors.

Mathematics 2050 is a required course for majors in mathematics and statistics, and computer science. It is also a course that does not require any knowledge of calculus.

Text. The text for this course has been, at various times, *Linear Algebra: A Pure and Applied First Course* by Edgar Goodaire (Pearson) **OR** *Elementary Linear Algebra* by Howard Anton (Wiley) **OR** *Linear Algebra with Applications* by Keith Nicholson (McGraw Hill) **OR** *Linear Algebra I: Course Notes for MATH 2050* by Edgar Goodaire (Kendall Hunt).

Marks. Although the exact formula may vary from semester to semester, normally 40% of the final grade is given for assignments and a term test, and 60% for a final examination.

Calendar description. **2050 Linear Algebra I** includes the topics: Euclidean n-space, vector operations in 2- and 3-space, complex numbers, determinants, and systems of linear equations.
Prerequisite: A combination of placement test and high school Mathematics scores acceptable to the Department or 3 credit hours in first year Mathematics courses.
Note: Credit cannot be obtained for both Mathematics 2050 and the former Engineering 2402.

Offered. Fall, Winter, Spring