MATHEMATICS 3100
INTRODUCTION TO DYNAMICAL SYSTEMS

If a differential equation (flow) or difference equation (map) is nonlinear, It usually cannot be solved in exact form. Therefore, we focus instead on the geometrical and functional properties of these equations, so that we can find essential information about the solutions without ever attempting to find the solution completely. For example, we can find out whether there are periodic solutions, whether typical solution will tend toward a particular value, and whether the final behaviour will affected in a significant way if the initial conditions or the parameter values are altered.

Using the dynamical systems approach we can investigate systems displaying very complicated behaviour. Some of the systems we will study in MATH 3100 are chaotic, where the solutions seem to have no pattern whatsoever, fluctuating randomly in time, but are actually completely determined by the equations and the initial conditions.

Many useful applications will be discussed. Dynamical systems theory is used to describe any observable quantities that change over time, so we can discuss anything from the motion of a pendulum to a beating heart, trends in the stock market, or the spread of AIDS.

Text: Suggested texts include:
Nonlinear Dynamics and Chaos by Steven H. Strogatz, Addison-Wesley, and
Dynamical Systems with Applications Using Maple by Steven Lynch, Birkhäuser.

Marks: The evaluation will normally be based on assignments, a course project, a term test and a final examination.

Calendar Description: 3100 Introduction to Dynamical Systems examines flows, stability, phase plane analysis, limit cycles, bifurcations, chaos, attractors, maps, fractals. Applications throughout.
Three lecture hours per week.
Prerequisite: Mathematics 2260 (or 3260).
Note: Credit can be obtained for only one of Mathematics 3100 and the former 3190.

Offered: Winter