3A7 Dynamical Systems and Chaos

(MATH3327)

7. Lorenz Equations and Chaos
Read the paper!

On the next page please find some of the important ideas we discussed.
Deterministic Non–periodic Flow

Lorenz model is a simplification of the Bernard Rayleigh system. → Simplistic model of the Navier–Stokes equations. (Details in Sec. 5)
Main purpose of Lorenz’s research: Weather forecasting.
Non–periodic flows make life not easy...
Classification of trajectories:

absence or presence of transient properties.
stability or instability (sensitivity to initial conditions).
presence or absence of periodic behaviour.

Connection between sensitivity to initial conditions and instability.
If it is not a fixed point, a periodic or quasi–periodic orbit, and no transient behaviour than it is a non–periodic flow.

Bifurcation of the fixed points.
Numerical solutions, the Lorenz attractor and simplistic forecasting using the Tent–map like maximum map of the z–component.