

MA32011 Lecture slides

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Lecture 1

Discrete v continuum time

Physics and biology

Autonomous v nonautonomous systems

Linear v nonlinear

Quantitative v qualitative

Phase space

- ▶ Phase space
- ▶ Phase point
- ▶ Trajectory
- ▶ Phase portrait

Fixed points and their stability

Fixed points are singular points in the vector/flow field

Uniqueness and existence

Suppose that

$$\dot{x} = f(x), \quad x(0) = x_0. \quad (1)$$

If f is continuously differentiable on an open interval D of the x axis and x_0 is a point in D , Equation 1 possesses a unique solution on some time interval $(-\tau, \tau)$.

Nondimensionalisation

- ▶ Rescale variables to obtain system with fewer free parameters

Numerical solutions - Forward Euler

$$x(t + \Delta t) = x(t) + \Delta t f(x(t)).$$