Taking to a higher dimension: phase-plane analysis

Lecture 4
Mazzag

Differential equations of two variables

- Are systems of two variables big enough?
- Introduction to pplane
- How to draw and interpret trajectories
- Stability in 2D

$$\frac{dx}{dt} = -x$$

$$\frac{dy}{dt} = y$$

Limit-cycle oscillations: a new type of stability

- Examine behavior for a=0
- What happens if a>0

  (limit cycle oscillations)
- Limit cycles and natural phenomena

$$\frac{dx}{dt} = -y + a\,x\left(x^2 + y^2\right)$$

$$\frac{dy}{dt} = x + a\,y\left(x^2 + y^2\right)$$