Math 23, Spring 2007

Lecture 1

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Outline

Course Overview

- `http://www.math.dartmouth.edu/~m23s07`
- Matlab

Concepts from reading

Ordinary differential equations

Definition

An ordinary differential equation (ODE) is simply an equation that includes a function f and one or more of its derivatives.

Example

$$\frac{df}{dt} = \sin(t)$$

Example

$$\frac{df}{dt} = f(t)$$

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Real world examples

- Physical laws: $F = ma$
- Exponential growth and decay: *the rate of change in the amount of material is proportional to the current amount of material*
- Predator-Prey dynamics:
  - Growth assumption
  - Predation assumption: *e.g. each predator kills x prey each day*
  - Generalizations: model predator population, add natural death, etc.

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Direction fields

A direction field is a way to visualize certain ODE and to qualitatively examine its solutions.

- $$\frac{dy}{dt} = f(t, y)$$
- At each point (y_0, t_0), draw a vector with slope $f(t, y)$.
- Solutions to the ODE can be seen in the field plot.
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Work for next class

- Reading: 2.1,2.2
- Homework 1 is due 4/2
- Install matlab, get and use dfield7.m, intro.m