

Syllabus

Due Jan 17 at 12a.m.

Python Assignment 1: Plotting Solutions and Slope Fields

Due Jan 17 at 12a.m.

Webwork 1

Due Jan 31 at 12a.m.

Python Assignment 2: Euler's Method

Due Feb 28 at 12a.m.

Python Assignment 3: Second Order Equations

Due Mar 28 at 12a.m.

Python Assignment 4: Linear Systems

Due Apr 9 at 12a.m.

Python Assignment 5: Nonlinear Systems

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Topics

0. Introduction

1. First order equations (Ch. 1, 7 hr)

Integrals as solutions 1.1

Slope fields and unique existence 1.2

Separable equations 1.3

Linear equations and the integrating factor 1.4

Autonomous equations 1.6

Numerical methods: Euler, Improved Euler and Runge-Kutta 1.7 +
note

Exact equations 1.8

2. Second order linear equations (Ch. 2, 8 hr)

Second order linear ODEs (method of reduction of order) 2.1

Constant coefficient second order linear ODEs 2.2 +**note**

Mechanical vibrations 2.4

Nonhomogeneous equations (undetermined coefficients) 2.5

Forced oscillations and resonance 2.6

3. Laplace transforms (Ch. 6, 5 hr)

Definition and examples 6.1

Transforms of derivatives and ODEs 6.2

Convolution 6.3

Dirac delta and impulse response 6.4

4. Linear systems (Ch. 3, 8 hr)

Introduction to systems of ODEs 3.1-3.3

Eigenvalue method 3.4

Two dimensional systems and their vector fields 3.5

Second order systems and applications 3.6 (skipped)

Multiple eigenvalues 3.7

Matrix exponentials 3.8 (skipped)

Nonhomogeneous systems (variation of parameters) 3.9

5. Nonlinear autonomous planar systems (Ch. 8, 5 hr)

Critical points and linearization 8.1

Stability and classification of isolated critical points 8.2

Applications 8.3

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