

# Computational Physics Laboratory report

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Date

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## 1 Error analysis

### 1.0.1 Approximating exponentials

### 1.2 Floating-point arithmetic and roundoff errors

#### 1.2.1 Computing the Basel problem

### 1.3 Error propagation and condition number

#### 1.3.1 Computing statistical momenta

#### 1.3.2 Condition number: study of a simple algorithm

## 2 Linear systems

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### 2.1 Forward- and back-substitution

### 2.2 LUP Decomposition

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### 2.3

## 3 Interpolation

## 4 Roots of nonlinear equations

## 5 Numerical integration

### 5.1 Newton-Cotes formula

#### 5.1.1 Trapezoidal rule

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#### 5.1.2 Simpson's rule

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### 5.2 Free-nodes integration

#### 5.2.1 Nodes and weights of Gauss-Legendre rule

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Remarks

**5.2.2 Integrals with Gauss-Legendre rule**

**5.3 Advanced topics in integration**

**6 Ordinary differential equations**