

Outline of Math 538

1 Classical Asymptotics

- A Asymptotic Series
 - 1 A Simple Example
 - 2 Order Symbols
 - 3 Sequences and Series
 - 4 Operations on Asymptotic Series
- B Expansion of Integrals
 - 1 Gamma Function
 - 2 Elementary Examples
 - 3 Integration by Parts
 - 4 Laplace Integrals
 - 5 Laplace's Method
 - 6 Fourier Integrals
 - 7 Method of Stationary Phase
 - 8 Method of Steepest Descent
- C Asymptotic Solution of Linear ODEs
 - 1 Classification of Singular Points
 - 2 Behaviour near Ordinary Points
 - 3 Behaviour near Regular Singular Points
 - 4 Behaviour near Irregular Singular Points

2 Singular Perturbations

- A Perturbation Theory
 - 1 Introduction
 - 2 Regular Perturbations
- B Matched Asymptotic Expansions
 - 1 A Simple Example
 - 2 Expansion Operators
 - 3 Method of Matched Asymptotic Expansions
 - 4 More General Expansions
 - 5 Application to PDEs
- C WKB Theory
 - 1 Exponential Approximation
 - 2 Liouville-Green Transformation
 - 3 Turning Points
 - 4 Langer Transformation
- D Multiple Scales
 - 1 Secular Terms
 - 2 Derivative Expansion Method

- 3 Two-Variable Expansion
- 4 Generalized Method
- 5 Application to PDEs
- E Other Perturbation Techniques
 - 1 Renormalization
 - 2 Method of Averaging
 - 3 Generalized Method of Averaging

3 Group Methods

- A Dimensional Analysis
- B Stretching Variables
- C Lie Groups