MATH 4708/5408- Asymptotic Methods of Applied Mathematics

Fall 2024

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Overview:

The analysis of model systems (e.g differential or difference equations) is a key component in numerous fields of study. However, in the absence of exact solutions, extraction of information and therefore understanding can be a significant challenge. In recent decades a robust and widely used branch of applied analysis has arisen in order to give researchers a mathematical framework with which to find successive approximations and limiting behaviour of solutions. This course will provide an introduction to these techniques as well as an understanding of the fundamental ideas and limitations which underlie them. It is appropriate for students in a broad range of fields having a strong mathematical background. Pre-requisites are differential equations (e.g. MATH 2545, 3008 and/or 3705), and to lesser extent complex analysis (MATH 3007/3057).
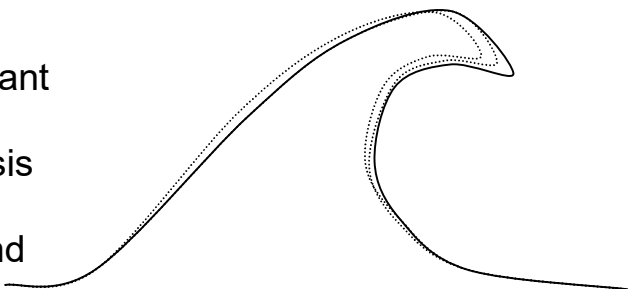
Text: Advanced Mathematical Methods for Scientists and Engineers – Bender and Orszag

Specific Topics Include:

- Asymptotic Series
- Asymptotic Solution of Differential Equations
- Asymptotic Expansion of Integrals
- Perturbation Theory
- Boundary Layer Problems
- WKB Theory

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