Numerical Methods: Introduction

The study of differential equations has three main facets:

- Analytic methods (also known as exact or symbolic methods).

- Geometric methods.

- Numerical methods.

In the first two sessions we introduced some of the tools from the first two categories; in this session, some methods from the third are presented.

Before proceeding, one should stress that most differential equations cannot be solved exactly; the importance of geometric and numerical methods should not be underestimated.

Most of the session is devoted to one of the most basic numerical technique, *Euler's method*. We will learn how to implement it, and work through several examples. However, the method has limitations: without sufficient caution, it can often return answers with high errors. We will learn how to try to control and estimate these errors, and about some pitfalls to avoid. In the final part of this session, we will be introduced briefly to some more sophisticated and accurate numerical techniques.

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