Introduction to Dynamics

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CONTENTS

Contents

PREFACE

Modern dynamics owes as much to Poincaré and Liapounov as to Lagrange and Hamilton, so we introduce Hamiltonian dynamics through the qualitative theory of differential equations and we highlight the geometry of phase curves and the theory of stability. Each subject, from the elementary theory of first-order systems, up to the discoveries on chaotic motion in recent decades, is introduced through simple examples. The mathematical background required of the reader is confined to 2×2 matrices, ordinary differential equations and the calculus of two variables (apart from appendix 1). Some knowledge of elementary Newtonian mechanics would be helpful, but we include other applications, including the dynamics of biological populations.

For simplicity we restrict our attention to first- and second-order systems and to Hamiltonian systems with one degree of freedom. This approach is not nearly so restrictive as one might think and enables us to introduce to undergraduates many important ideas that have previously been confined to graduate teaching or research.

The stronger connexions between the chapters are illustrated in the diagram at the end of the preface, but more advanced students or research workers should find that they can usefully dip into the book with a little cross-reference.

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More information

Stronger connexions between chapters