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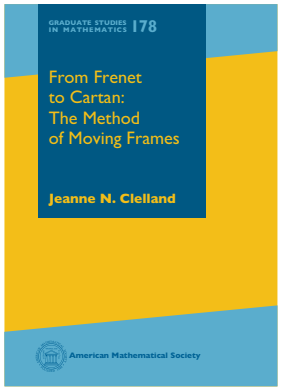

From Frenet to Cartan: The Method of Moving Frames

(GSM/178,2017)[1]

By Jeanne N. Clelland

Jeanne Clelland's book *Moving Frames* introduces graduate level differential geometry using the highly intuitive notion of frames. The approach has a particularly natural appeal to the kinetic learner: one can imagine walking along a hilly landscape watching the view change as the road navigates the contours of the hillside. Clelland takes the reader through the background, definitions and properties of this powerful tool, and includes examples and computational methods that allow the reader to explore and experience its effectiveness.

This book assumes some basic knowledge of linear algebra and the theory of differentiable manifolds. After a review of differential forms, tensors and Lie algebras, Clelland introduces moving frames for curves and surfaces in Euclidean space, and then proceeds to other geometries including Minkowski, affine and projective spaces. Using this language, she builds the theory of minimal surfaces and proves Bäcklund's theorem on pseudo-spherical line congruences. At the end of the book, she turns to the case of non-flat Riemannian manifolds and defines the Levi-Civita connection.

Exercises are interspersed throughout the text to enhance understanding and fill in details that will be useful in later sections. Coding is also a big feature of this book. Clelland includes many exercises and projects to do explicit calculations using Maple's Cartan package.

[1]The Graduate Studies in Mathematics Series *contains textbooks aimed at graduate level courses at the pre-qual and post-qual level.*

The AMS BookShelf is prepared bimonthly by AMS Senior Editor Eriko Hironaka. Her email address is exh@ams.org.

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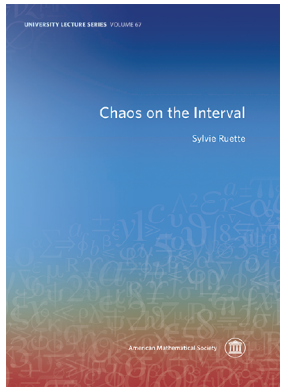

Chaos on the Interval

(ULECT/67, 2017)[2]

By Sylvie Ruette

In *Chaos on the Interval* Sylvie Ruette beautifully demonstrates the importance of the particular in understanding the universal. The book begins by laying out the language of continuous dynamical systems using continuous maps from the unit interval as its main example. It then proceeds to show that interval maps have startlingly intricate structure, which also lead to insights for the cases of more general and higher dimensional systems.

The overarching theme of the book is the interplay between properties of transitivity, periodic points, topological mixing, and sensitivity to initial conditions, and how these relate to chaos and entropy. In the first half of the book Ruette presents two foundational results: Sharkovsky's Theorem on orders of periodic points, and the Misiurewicz Theorem on existence of horseshoes for positive entropy maps. The second half of the book is devoted to two notions of chaotic interval maps: one, due to Li-Yorke, rests on the existence of an uncountable scrambled subset, another due to Devaney, is one that is transitive, sensitive to initial conditions, and has a dense set of periodic points.

The book contains results that are scattered in the literature (as well as some well known theorems), with full proofs and details not always found in the original articles in which they appeared.

For graduate students and researchers who are seeing the theory of interval maps and chaos for the first time, this book provides a self-contained, well-motivated, and highly accessible introduction. For those seeking a review of the theory, this book provides a delightful refresher.

[2]The AMS University Lecture Series *features self-contained expositions of currently active research areas in mathematics.*