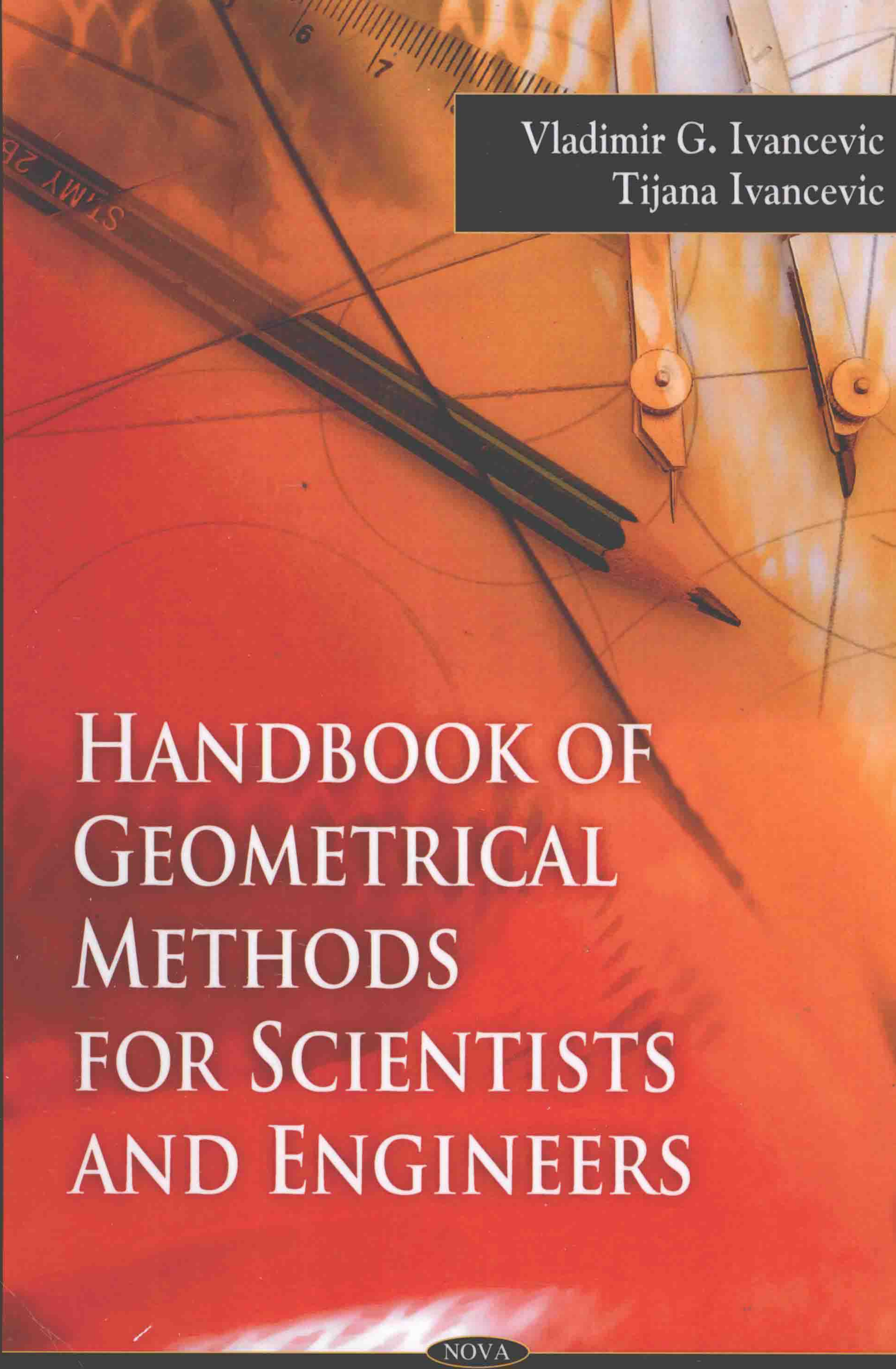

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Handbook of Geometrical Methods for Scientists and Engineers

NOVA

HANDBOOK OF GEOMETRICAL METHODS FOR SCIENTISTS AND ENGINEERS

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AND
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HANDBOOK OF GEOMETRICAL METHODS FOR SCIENTISTS AND ENGINEERS

Dedicated to Nick, Atma and Kali

Preface

Handbook of Geometrical Methods for Scientists and Engineers is an undergraduate applied mathematics text, compiled as a collection of *concepts* and *formulas* of modern geometrical and topological methods designed for use in science and engineering. These geometrical methods are currently being used for modelling complex systems in theoretical physics, chemistry and biology, nonlinear dynamics and nonlinear control, as well as mathematically–enriched human sciences (medicine, psychology, sociology and economics).

The *Handbook* contains an easy–to–follow essence of geometrical and topological methods for modelling complex dynamical systems, extracted from our five graduate–level monographs (including over 2000 cited references in total):

1. Geometrical Dynamics of Complex Systems: A Unified Modelling Approach to Physics, Control, Biomechanics, Neurodynamics and Psycho-Socio-Economical Dynamics. Springer, 2006;

2. Complex Dynamics: Advanced System Dynamics in Complex Variables, Springer, 2007;

3. Applied Differential Geometry: A Modern Introduction. World Scientific, 2007;

4. Complex Nonlinearity: Chaos, Phase Transitions, Topology Change and Path Integrals, Springer, 2008; and

5. Quantum Leap: From Dirac and Feynman, Across the Universe, to Human Body and Mind. World Scientific, Singapore, 2008.

The only necessary background for efficient understanding and using of the *Handbook* is standard Engineering Mathematics IB (namely, Calculus and Linear Algebra).

Adelaide,
Feb 2009

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Part I

Geometrical Preliminaries