Geometric Calculus is a language for expressing and analyzing the full range of geometric concepts in mathematics. Clifford algebra provides the grammar. Complex numbers, quaternions, matrix algebra, vector, tensor and spinor calculus and differential forms are integrated into a single comprehensive system. The geometric calculus developed in this book has the following features: a systematic development of definitions, concepts and theorems needed to apply the calculus easily and effectively to almost any branch of mathematics or physics; a formulation of linear algebra capable of detailed computations without matrices or coordinates; new proofs and treatments of canonical forms including an extensive discussion of spinor representations of rotations in Euclidean $n$-space; a new concept of differentiation which makes it possible to formulate calculus on manifolds and carry out complete calculations of such things as the Jacobian of a transformation without resorting to coordinates; a coordinate-free approach to differential geometry featuring a new quantity, the shape tensor, from which the curvature tensor can be computed without a connection; a formulation of integration theory based on a concept of directed measure, with new results, including a generalization of Cauchy’s integral formula to $n$-dimensional spaces and an explicit integral formula for the inverse of a transformation; a new approach to Lie groups and Lie algebras.

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