PREFACE

Multivariable and vector calculus is an essential subject of the mathematical education for scientists and engineers. This book is aimed primarily at undergraduates in mathematics, engineering, and the physical sciences. Rather than concentrating on technical skills, it focuses on a deeper understanding of the subject by providing many unusual and challenging examples. The topics of vector geometry, differentiation, and integration in several variables are explored. It also provides numerous computer illustrations and tutorials using *Maple*® and *MATLAB*®. The software applications allow the students to bridge the gap between analysis and computation. Mainly, this book compromises three chapters and four appendices.

Chapter 1 provides vectors and parametric curves. It contains points and vectors on the plane, scalar products on the plane, linear independence, geometric transformations in two dimensions, determinants in two dimensions, parametric curves on the plane, vectors in space, cross products, matrices in three dimensions, determinants in three dimensions, some solid geometry, Cavalieri and the Pappus-Guldin rules, dihedral angles and platonic solids, spherical trigonometry, canonical surfaces, parametric curves in space, and multidimensional vectors.

Chapter 2 provides differentiation of functions of several variables. This chapter mainly discusses some topology, multivariable functions, limits and continuity, definition of the derivative, the Jacobi matrix, gradients and directional derivatives, Levi-Civita and Einstein, extrema, and Lagrange multipliers.

Chapter 3 provides integrations of functions of several variables. It contains differentiation forms, zero-manifolds, one-manifolds, closed and exact forms, two-manifolds, change of variables in double integrals, change to polar coordinates, three-manifolds, change of variables in triple integrals, surface integrals, and Green's, Stokes', and Gauss' Theorems.

Finally, the book concludes with four appendices: Appendix A covers a basic tutorial on *Maple* software; Appendix B includes a basic tutorial on *MATLAB*; Appendix C provides the answers to odd-numbered exercises; Appendix D reviews the common, useful mathematical formulas.

Companion files (figures from the text) are also available at info@merclearning.com.

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