



Multidimensional Analysis

By Hart, George W.

Book Condition: New. Publisher/Verlag: Springer, Berlin | Algebras and Systems for Science and Engineering | This book deals with the mathematical properties of dimensioned quantities, such as length, mass, voltage, and viscosity. Beginning with a careful examination of how one expresses the numerical results of a measurement and uses these results in subsequent manipulations, the author rigorously constructs the notion of dimensioned numbers and discusses their algebraic structure. The result is a unification of linear algebra and traditional dimensional analysis that can be extended from the scalars to which the traditional analysis is perforce restricted to multidimensional vectors of the sort frequently encountered in engineering, systems theory, economics, and other applications.

| 0. Introductory.- 0.1 Physical Dimensions.- 0.2 Mathematical Dimensions.- 0.3 Overview.- Exercises.- 1. The Mathematical Foundations of Science and Engineering.- 1.1 The Inadequacy of Real Numbers.- 1.1.1 The Error of Substitution.- 1.1.2 The Problem with Linear Spaces.- 1.1.3 Nondimensionalization.- 1.1.3 Dimensioned Algebras.- 1.2 The Mathematics of Dimensioned Quantities.- 1.2.1 Axiomatic Development.- 1.2.2 Constructive Approach.- 1.2.3 Constraints on Exponentiation.- 1.2.4 The Dimensional Basis.- 1.2.5 Dimensional Logarithms.- 1.2.6 The Basis-Independence Principle.- 1.2.7 Symmetries of Dimensioned Quantities.- 1.2.8 Images.- 1.3 Conclusions.- Exercises.- 2. Dimensioned Linear Algebra.- 2.1 Vector Spaces and Linear Transformations.-...



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