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Differential equations and their applications, by M. Braun, Applied Mathematical Sciences, vol. 15, Springer-Verlag, New York, Heidelberg, Berlin, 1975, xiv + 718 pp., \$14.80.

Applied mathematics cannot reasonably be described as a single field. Unlike pure mathematics, which does possess a unity and a definite historical tradition, applied mathematics today is a collection of subjects bound loosely together by their common reliance on mathematical notation, ideas and methods. Because of this, a project of writing an introduction to applied mathematics for undergraduates may seem to be a hopeless task.

Martin Braun has shown that one should not give up so easily. Certainly many people who think of themselves as applied mathematicians will not find their favorite circle of ideas in an elementary text on differential equations. What is to be found, besides an excellent leisurely development of differential equations, is an introduction to the interaction between mathematics and its applications.

Mathematics can play an important, sometimes crucial, role in the structure of other disciplines. The fundamental ideas and relations of a subject can sometimes be expressed quantitatively and unambiguously using mathematical notation. When this is done, a mathematical model of some aspect of the subject in question results. Mathematics then provides frameworks in which the relations in the model may be analysed and manipulated to yield predictions. These predictions may be compared with data gathered in the field to foster confidence in certain aspects of the model and to discover shortcomings of the model. This process can, and often does, lead to an interaction between mathematics and the discipline under study whereby the model is successively improved. Perhaps the most exciting aspect of the modeling process is when new phenomena come to light whose existence was not previously recognized. Of course mathematics as a pure subject can benefit from this interaction as well.

These aspects of the modeling process find expression in Braun's book by way of a sequence of case studies of various applications. This is certainly not a new idea, even in the context of elementary differential equations. Engineering students have been subjected to 'problems analysis' courses for many years. Such courses typically exploit the case method to teach model building, and, on the side, offer a swashbuckling approach to the elements of differential equations. As we shall see, the present text offers more than just an up-to-date version of such courses.