Differential Equations. By A. COHEN, Johns Hopkins University. New York, D. C. Heath and Company, 1906. 270 pp.

WHAT from the outside looks like a small text book on differential equations turns out to be a much fuller discussion of the subject. By using good thin paper and eliminating unnecessary margin space, the author has given, in convenient size, quite as full a treatment as either Johnson or Murray. The mechanical work has been well done ; the book is well printed, well bound and the proofreading has been carefully done. Even the answers to the problems are accurate as far as they have been tested. A very useful feature of the book is a summary at the end of each chapter of the ground covered in the chapter.

The book opens in the usual way with a chapter on the formation of differential equations. Then equations of the first order and their geometric interpretation are taken up. Before going into equations of order higher than the first, the author introduces (with a question mark) a chapter on total differential equations with three or more variables. Many will feel like emphasizing the question mark. The author's arrangement has the advantage of giving the student miscellaneous exercises of the first order and first degree. It should tend to systematize his knowledge of this fundamental class.

In the chapter on linear equations with constant coefficients, there is a pretty general discussion of the methods of finding the particular integral. In addition to the two ways of breaking up $1/f(D)$, there are also the methods of variation of the parameters and of undetermined coefficients. No mention is made of the short methods of evaluating $e^{ax}/f(D)$, $\sin ax\, /f(D^2)$, etc., these being replaced by the method of undetermined coefficients. In this Dr. Cohen has taken a step forward. As treated by him, any linear equation with constant coefficients can be solved without the use of integration, provided the right hand member is made up of terms having a finite number of distinct derivatives. It is hardly as immediate as one or two of the short methods, but the advantage of having only a single method to carry in mind counterbalances this. It also puts into one general class all the equations to which the method is applicable.

Very little is given on second order equations, most of the special methods for these being in the chapter on equations of any order. A good chapter on integration in series is brought in, though it might have been moved forward to let the chapter on systems of equations come closer to partial differential equations.

The book would have been improved, I think, by the addition of some easier examples. Those given work out very nicely but require some skill and accuracy in algebra. No misprints of any consequence were found save on page 15, Example 6, *ay* is put instead of *dy*. Many interesting little historical notes have been inserted and references have also been added freely.

C. R. MacInnes.

Elements of the Kinematics of a Point and the Rational Mechanics of a Particle. By G. O. James. John Wiley and Sons, New York, 1905. xii + 171 pp.

On page 102 of this excellent little book the author states its object in the following words: "It is my purpose here to develop in a rigorous manner the elementary theory of the motion of a *material point* or *particle*, and to thereby furnish a point of departure for the consideration of the motion of bodies as they actually occur in the material universe. This elementary exposition will then serve as an introduction to that portion of the subject which is known as *rational mechanics*, and in which the mathematical theory of the motion of portions of matter of *ideal* forms is investigated under *ideal* conditions, leaving the special applications to the particular sciences." The first eight chapters (pages 1–100) are devoted to the kinematics of a point and the last chapters IX to XVII to the mechanics of a free particle. It is not necessary to give in detail the contents of each chapter, some of which are extremely short; it will suffice to state the general structural lines along which the author has laid out the contents of the book. These lines are kept adroitly before the eyes of the reader, who is led straight to the goal and does not lose himself in the detail of side issues. The geometric derivative of a vector and its projection on an arbitrary axis is the fundamental concept upon which velocity and acceleration and their components depend. They are studied in detail both in rectilinear and curvilinear motion, where in each case proper distinction is made between absolute and relative motion; this is next extended to angular and axial motion, where again the same notions come into use which have been developed under linear motion. Here too the peri-