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BOOK REVIEW

A New Chapter for Pythagorean Triples by A. G. Schaake and J. C. Turner

In this book, the authors develop a new method for generating all Pythagorean triples. They also illustrate that their new method can be used to find solutions to the Pellian equations $x^2 - Ny^2 = \pm 1$ where N is square-free. Since the book contains only accusations and examples, it is impossible to verify that their method is mathematically correct even though the numerous examples found in the book seem to imply that it does work. The authors have published a Departmental Research Report, with proofs of their methods, which may be had, on request, with the book. The reviewer has not read the Research Report.

The method, at least to this reviewer, appears to be new. Furthermore, the method is *a very neat way of relating Pythagorean triples to continued fractions* via what is called a "decision tree." However, the reviewer does not accept the new method with the enthusiasm of the authors because they make claims which, in the opinion of the reviewer, may not be true. Several of these claims will be discussed later in this report.

The basic claim of the authors is essentially that (x, y, z) is a Pythagorean triple if and only if

$$x = \frac{q - r}{2n}, \quad y = \frac{p + s}{2n}, \quad z = \frac{q + r}{2n}$$

where r/s and p/q are, respectively, the last two convergents of a continued fraction of the form

$$[0; u_1, u_2, \ldots, u_i, v, 1, j, (v + 1), u_i, \ldots, u_2, u_1].$$

Using the parity of v, a nice contraction method developed by the authors for the set of values $u_1, u_2, \ldots, u_i$ and the size of j, the authors illustrate that there are five families which predict the value of n.

Most of the book is spent on the development of the techniques used and examples which show how the techniques work. The explanations are clear and the examples are well done. Actually, there are far more examples than are probably needed. The book is very easy to read. In fact, several chapters could be reduced in size or eliminated since anyone with a background in number theory would know most if not all of the material in Chapters 1 and 2. Other parts of the book could also be left out. For example, the tables on pages 127 to 137 were of no value to the reviewer. To be fair to the authors on this point, however, in the Foreword they do state that the material is intended to be accessible to teachers and college students, as well as to number theorists and professional mathematicians. *(Please turn to page 155)*