RESEARCH ANNOUNCEMENTS

BULLETIN (New Series) OF THE
AMERICAN MATHEMATICAL SOCIETY
Volume 23, Number 1, July 1990

TOWARDS COMPUTERIZED PROOFS OF IDENTITIES

HERBERT S. WILF AND DORON ZEILBERGER

1. Introduction

Many of the seemingly trivial facts that we take for granted are really theorems, like the fact that $11 \times 12 = 132$, or that $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$. The reason that these are no longer thought of as theorems is that nowadays quite routine algorithms perform these tasks. The same is true, thanks to modern computer algebra programs, for the "theorem" that $(a+b)^{20} = a^{20} + \cdots$, or, thanks to the recent completion by Risch and others [14, 15] of the problem of finding a complete algorithm for integration in finite terms, the same is true for the algorithmic evaluation of indefinite integrals of "elementary functions."

The purpose of this note is to announce a number of results and algorithms which, collectively, do the same for large classes of identities that occur in combinatorics and in the theory of special functions.

Historically, even the binomial theorem itself was considered to require a custom-made proof, but we will show that it, along with a very large class of identities, can be proved by computers. It should be remarked that one does not need to "trust the computer" blindly. Although the proofs are *discovered* by the computer, it

Received by the editors August 24, 1989 and, in revised form, October 19, 1989.
1980 *Mathematics Subject Classification* (1985 *Revision*). Primary 05A19.
The first author was supported in part by the U.S. Office of Naval Research.
The second author was supported in part by the U.S. National Science Foundation.