

AD-A198 149

RESEARCH ON ALGEBRAIC MANIPULATION(U) MASSACHUSETTS
INST OF TECH CAMBRIDGE J MOSES 15 APR 87
AFOSR-TR-87-2039 AFORR-85-0264

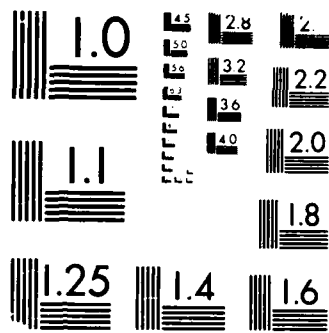
1/1

UNCLASSIFIED

F/G 12/1

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

2

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION OF THIS REPORT UNCLASSIFIED			3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited.		
AD-A190 149 (S)			5. MONITORING ORGANIZATION REPORT NUMBER(S) AFOSR-TR-87-2039		
6a. NAME OF PERFORMING ORGANIZATION Massachusetts Inst of Tech		6b. OFFICE SYMBOL (if applicable)	7a. NAME OF MONITORING ORGANIZATION AFOSR/NM		
6c. ADDRESS (City, State, and ZIP Code) Cambridge, MA			7b. ADDRESS (City, State, and ZIP Code) Bolling AFB, DC 20332		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION AFOSR/NM		8b. OFFICE SYMBOL (if applicable) NM	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER AFOSR-85-0264		
8c. ADDRESS (City, State, and ZIP Code) Bolling AFB, DC 20332			10. SOURCE OF FUNDING NUMBERS		
PROGRAM ELEMENT NO 61102F		PROJECT NO. 2304	TASK NO. A7	WORK UNIT ACCESSION NO.	
11. TITLE (Include Security Classification) Research On Algebraic Manipulation.					
12. PERSONAL AUTHOR(S) Joel Moses					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM 9/01/85 TO 8/31/86	14. DATE OF REPORT (Year, Month, Day) 87/04/15		15. PAGE COUNT 2
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
19. ABSTRACT (Continue on reverse if necessary and identify by block number) The focus of this research was algebraic manipulation or symbolic computation as in MACSYMA. The dilogarithm function was studied to obtain methods for the integraton of dilogs in closed form. The work points the way for a generalization of the concept of closed form solutions.					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> OTHER USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL Abraham Waksman			22b. TELEPHONE (Include Area Code) (202) 767-5025		22c. OFFICE SYMBOL AFOSR/NM

DTIC
SELECTED
JAN 20 1988

UNCLASSIFIED

FINAL REPORT
TO THE
UNITED STATES AIR FORCE
ON
RESEARCH ON ALGEBRAIC MANIPULATION
GRANT AFOSR 85-0264

by
Joel Moses
Massachusetts Institute of Technology
April, 1987

Accession For	
NTIS CRA&I	J
DTIC TAB	
Unannounced	
Justification	
By	
Date	
Author	
Title	
DIA	
A-1	



Our major accomplishments relate to the dilogarithm function:

$$Li(x) = \int \frac{\log(x)}{1-x} dx$$

The dilogarithm was thought to have hundreds and possibly an infinity of independent identities. We show that it only has two. One is similar to the logarithm identity and the other is similar to a special case of the exponential identity.

These identities vastly simplify the process of integration of dilogs in closed form. First, we demonstrate a generalization of Liouville's theorem, showing the relationship of dilogs in the integral to that in the integrand. Second, we generalize all cases but the algebraic one for Risch's integration algorithm when dilogs can exist in both the integrand and integral.

The dilogarithm is the first truly nontrivial special function that has been analyzed to this extent. This work points the way for a generalization of the concept of "closed form." Such a generalization may increase the value of algebraic manipulation techniques to a broader class of problems.

This work was turned done largely by my graduate student Jamil Baddoura.

END

DATE

FILMED

5-88

DTIC