

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER

LIBRARY ROUTINE TA 2 - 156

TITLE Arc Tangent Auxiliary to the Floating Point Routine (DCI or SADOI)
NUMBER OF WORDS 48 words
TIME 15 milliseconds
PURPOSE To determine the arc tangent of a number in the floating accumulator
ACCURACY Same as that of the floating point program, i.e., Library Routine A 1. Possible error ± 1 in the 9th decimal place.
TEMPORARY STORAGE 0, 1, 2
METHOD OF USE The routine is entered with the argument in the floating accumulator in standard form. Entry from A 1 is made with an 8J order.

The program should contain Library Routines A 1 and A 3 at locations decided by parameters as shown below.

After calculation control is returned to word 19 of Library Routine A 1.

RESULT The results remain in the floating accumulator in the standard form, i.e., exponent in 1S3 and one-half the fraction in S3. Answers are all modulo π and lie in the range $-\pi/2 \leq \theta \leq \pi/2$.

PRESET PARAMETERS
S 3, 1 S 3 Floating accumulator
S 4 first word of A 1
S 5 first word of A 3
RT: 10/8/59

DATE	<u>11/9/54</u>	Rt:	<u>6/5/58</u>
PROGRAMMED BY	<u>Lily Seshu</u>		
APPROVED BY	<u>J. P. Nash</u>		

LOCATION	ORDER		NOTES	PAGE 1
0	COOK(TA2) 41 1F			
	L1 S3			
1	32 2L			
	L7 37L		Replace x by $ x $ and take note of sign	
2	22 3L			
	40 S3			
3	L3 37L			
	40 37L			
4	L1 1S3			
	L4 41S4			
5	32 9L			
	F4 130S4			
6	40 1S3			
	L5 33S4		If exponent is ≥ 1 , form $1/ x $. Denote	
7	66 S3		new argument by $ x ^t$ and place 1/2 in 1F	
	S5 F			
8	10 2F			
	40 S3			
9	49 1F			
	50 9L			
10	26 S5			
	S9 40L		$ x ^t$ in machine form	
11	S0 F			
	40 2F			
12	36 16L			
	11 1F			
13	SJ F			
	40 F			
14	L5 2F			
	10 2F			
15	66 F		If $ x > 1/2$ form	
	26 18L		$1/2 \tan [\tan^{-1} 1/2 - x ^t]$	
16	L3 1F			
	32 17L			
17	22 12L			
	49 46L			

LOCATION	ORDER	NOTES	PAGE 2
18	S5 F		
	40 F		
19	7J F		
	00 2F		
20	40 2F		
	L5 10L		
21	42 22L		
	50 39L		
22	7J 2F		
	L4 ()L		
23	40 47L		
	50 47L		
24	F5 22L	Calculate arc tangent	
	42 22L		
25	L0 36L		
	36 22L		
26	L3 46L		
	36 28L		
27	7J S3		
	26 30L		
28	L5 41S4		
	40 1S3		
29	79 F		
	L4 38L		
30	40 S3		
	L5 37L		
31	32 32L	Restore sign	
	L1 S3		
32	40 S3	Was $ x > 1?$	
	L3 1F		
33	36 35L		
	L5 37L		
34	L0 S3	If $ x > 1$	
	40 S3		
35	41 46L		
	26 19S4		

LOCATION	ORDER	NOTES	
36	LJ 2F L4 46L	End constant for \tan^{-1} series	
37	40 F 00 2853 9816 3397J		
38	00 F 00 2318 2380 4501J		
39	00 F 00 3835 4364 687J		
40	NO F 00 4204 5564 8901J		
41	00 F 00 1093 1855 0894J		
42	NO F 00 3572 9264 9705J		
43	00 F 00 1999 9394 4717J		
44	NO F 00 1666 6675 9283J		Constants for series
45	40 F 00 4999 9999 9767J		
46	00 F 00 F		
47	00 F 00 F		