

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER

ILLINOIS CODE 64 - S2

TITLE Exponential (SADOI or DOI)
TYPE Closed
NUMBER OF WORDS 33
TEMPORARY STORAGE 0, 1
ACCURACY Maximum error 2^{-38}
DURATION 12 milliseconds
DESCRIPTION The routine replaces A by e^A if A is negative.
NOTES If a large range is required it can be readily achieved
by squaring, using the identity
$$[\exp(x)]^{2^p} = \exp(2^p x)$$

RT: 10/13/60

DATE <u>August 13, 1956</u>
CODED BY <u>David J. Wheeler</u>
CHECKED BY <u>Bessie Cobb</u>
APPROVED BY <u>J. P. Nash</u>

LOCATION	ORDER BOOK(S2)		NOTES	PAGE 1	S2
0	S5 17L 40 F		Set Link		
1	L4 9L 42 16L				
2	50 F 01 3F		Look at 2^{-1} , 2^{-2} , 2^{-3} , of x Calculate table entry		
3	L4 L 36 4L				
4	42 14L 42 15L		Set table entry address		
5	11 3F S5 F				
6	L4 25L 40 F		$-1 - 1/16$ and remainder $(x-x_r)$ x		
7	50 26L L5 12L				
8	26 11L 7J F	From 12'			
9	L4 F 40 1F	By 11'	Evaluate $\exp(x-x_r - 1/16) - 1$		
10	50 1F L5 9L				
11	L4 13L 46 9L	From 8			
12	L0 27L 32 8L				
13	7J F L4 F				
14	40 1F 50 F	By 4'			
15	7J 1F L4 F	By 4'	e^x - table entry + table entry $\rightarrow e^x$		
16	32 16L 22 F	By 1'	link		

LOCATION	ORDER	NOTES	PAGE 2
17	00 F 00 3916 0562 6677 J	$e^{-15/16}$	
18	00F 00 4437 4731 0081 J	$e^{-13/16}$	
19	40F 00 0028 3157 7971 J	$e^{-11/16}$	
20	40F 00 0697 8282 4731 J	$e^{-9/16}$	Table Entries
21	40F 00 1456 4852 6428 J	$e^{-7/16}$	
22	40F 00 2316 1562 8947 J	$e^{-5/16}$	
23	40F 00 3290 2911 8180 J	$e^{-3/16}$	
24	40F 00 4394 1306 2813 J	$e^{-1/16}$	
25	78 F 00 F	- 1 - 1/16	
26	00 F 00 0013 8888 8889 J	1/16	
27	L1 33L 34 1F	End Constant	
28	00 F 00 0083 3333 3333 J	$1/\sqrt{5}$	
29	00F 00 0416 6666 6667 J	$1/\sqrt{4}$	
30	00F 00 1666 6666 6667 J	$1/\sqrt{3}$	
31	40 F 00 F	$1/\sqrt{2}$	
32	00 F 00 F	0	