TITLE: Exponential with Scaled Exponent

TYPE: Closed subroutine with one program parameter

NUMBER OF WORDS: 30

TEMPORARY STORAGE: 0, 1, 2

ACCURACY: Maximum error 5×10^{-12}

DURATION: 14 milliseconds

DESCRIPTION: This routine replaces y the contents of A before entry
                        by e^{-x}. The quantity x is in the range $0 \leq x < 2^{37}$.
                        The entry is

$$q \quad 50 \ nF$$
$$50 \ qF$$
$$\overline{26 \ --}$$

where n is the binary scaling of x, that is:

$$y = x \cdot 2^{-n} \quad 0 \leq n < 63$$

METHOD: The computation is done as follows:

(1) x is unscaled and then divided by $\ln 2$

(2) e^{-w} is computed where w is the remainder from step (1)

(3) e^{-w} is shifted right z places where z is the integer
     part from step (1)

i.e.

$$x = z \ln 2 + w \ (z \ \text{integer}) \ (w < \ln 2)$$
$$e^{-x} = e^{-(z \ln 2 + w)} = e^{-w}(e^{-z \ln 2}) = e^{-w} \, 2^{-z}$$

The qunatity e^{-w} is computed by the same method as
used by routine S 4 - 212.

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APPROVED BY

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LOCATION	ORDER	NOTES
	OOK	
0	40 F	
	S5 F	
1	F4 L	
	42 24L	Set link
2	46 3L	Set shift address to $n + 1$
	50 F	
3	01 F	
	66 27L	Divide by $\ln 2$
4	10 1F	
	40 F	Save remainder
5	K5 F	
	42 23L	Set shift address
6	L0 28L	
	36 8L	
7	23 24L	Jump if $e^{-x} < 2^{-40}$
	40 F	
8	89 1F	
	L4 F	
9	32 7L	Correct sign of remainder if necessary
	L5 F	Compute e^{-w} (See S4 - 212)
10	10 2F	
	50 F	
11	40 F	
	7J F	
12	40 1F	
	L5 25L	
13	40 29L	
	23 14L	
14	S5 F	
	10 3F	
15	L4 29L	
	40 2F	
16	L5 1F	
	10 5F	
17	66 2F	
	L5 29L	

LOCATION	ORDER	NOTES
18	LO 26L	
	40 29L	
19	LO 26L	
	36 14L	
20	LJ F	
	S4 F	
21	40 2F	
	50 28L	
22	L5 F	
	66 2F	
23	S9 F	Shift right z + 1 places
	10 F	
24	00 2F	Link
	22 F	
25	58 F	
	00 F	
26	10 F	Constants
	00 F	
27	58 2960F	*ln* 2
	SL 3049F	
28	80 F	
	00 40F	
29	00 F	
	00 F	