Mysterious calculator exercise

Try this on your calculator. Nobody knows why it works.

First we need some definitions.

Suppose d_n=divisor function of n=sum of positive divisors of n

Hence

$d_1=1$

$d_2=1+2=3$

$d_3=1+3=4$

$d_4=1+2+4=7$

$d_5=1+5=6$

$d_6=1+2+3+6=12$

etc.

And suppose h_n=n-th harmonic number=1/1+1/2+1/3+...+1/n

So

$h_1=1/1=1$

$h_2=1/1+1/2=3/2$ (alternatively $h_2=h_1+1/2=3/2$)

$h_3=1/1+1/2+1/3=11/6$ (alternatively $h_3=h_2+1/3=11/6$)

$h_4=1/1+1/2+1/3+1/4=25/12$ (alternatively $h_4=h_3+1/4=25/12$)

$h_5=1/1+1/2+1/3+1/4+1/5=137/60$ (alternatively $h_5=h_4+1/5=137/60$)

$h_6=1/1+1/2+1/3+1/4+1/5+1/6=49/20$ (alternatively $h_6=h_5+1/6=49/20$)

etc.

And define f_n=n-th Lagarias' number=$h_n+e^{h_n}\ln h_n$.

Then we have the

Proposition For all n>1, $f_n>d_n$.

And this is where the calculator comes in.

Check on the calculator for example $f_2>d_2$:

$f_2=3/2+e^{3/2}\ln(3/2)=3.32>d_2=3$.

And likewise for others:

$f_3=11/6+e^{11/6}\ln(11/6)=5.62>d_3=4$

$f_4=25/12+e^{25/12}\ln(25/12)=7.98>d_4=7$

$f_5=137/60+e^{137/60}\ln(137/60)=10.38>d_5=6$

$f_6=49/20+e^{49/20}\ln(49/20)=12.83>d_6=12$

etc.

Nobody knows why this works because the proposition is equivalent to the Riemann Hypothesis!

Lagarias proved equivalence in 2001: http://arxiv.org/PS_cache/math/pdf/0008/0008177v2.pdf