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19 Dec 80

N J A Sloane
Mathematics Research Center
Bell Telephone Labs
Murray Hill NJ 07974

Dear Mr Sloane:

I would be interested in any supplements for "A Handbook of Integer Sequences" that may have been, or will be produced.

Also, I have a sequence to propose for inclusion: the hilbert matrix inverse determinants (or the reciprocals of determinants of hilbert matrices).

I have not seen a sequence of these determinants published, but the formula for the inverses is given in "Basic Theorems in Matrix Theory", NBS App Math Series #57, 22 Jan 1960. The determinant of hilbert(4) is also given there.

Attached is 1) the inverse formula in APL (after factoring into binomial coefficients), 2) the first 7 hilbert inverses, & 3) the first 7 terms of the determinant sequence. Note, however, that each term is the product of: (previous term) x (last element of next inverse). The sequence formed of these last elements is in the handbook, #2087. The relationship between gaussian quadrature & hilbert inverse determinants is surprisingly not so distant.

A515

Sincerely yours,

John E Lauer

John E Lauer

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      ∇INVHILB[⎕]∇
    ∇ K←INVHILB N;J
[1]   K←(K∘.×K←(¯1*J)×J×(J!N)×N!N+(J←⍳N)-1)÷¯1+(⍳N)∘.+⍳N
    ∇


      INVHILB 1
     1
      INVHILB 2
     4          ¯6
    ¯6          12
      INVHILB 3
     9         ¯36          30
   ¯36         192        ¯180
    30        ¯180         180
      INVHILB 4
    16        ¯120         240        ¯140
   ¯120        1200       ¯2700        1680
    240       ¯2700        6480       ¯4200
   ¯140        1680       ¯4200        2800
      0⍕INVHILB 5
     25     ¯300     1050    ¯1400      630
   ¯300     4800   ¯18900    26880   ¯12600
   1050   ¯18900    79380  ¯117600    56700
  ¯1400    26880  ¯117600   179200   ¯88200
    630   ¯12600    56700   ¯88200    44100
      0⍕INVHILB 6
     36      ¯630      3360     ¯7560      7560     ¯2772
   ¯630     14700    ¯88200    211680   ¯220500     83160
   3360    ¯88200    564480  ¯1411200   1512000   ¯582120
  ¯7560    211680  ¯1411200   3628800  ¯3969000   1552320
   7560   ¯220500   1512000  ¯3969000   4410000  ¯1746360
  ¯2772     83160   ¯582120   1552320  ¯1746360    698544
      0⍕INVHILB 7
     49       ¯1176        8820      ¯29400       48510      ¯38808       12012
  ¯1176       37632     ¯317520     1128960    ¯1940400     1596672     ¯504504
   8820     ¯317520     2857680   ¯10584000    18711000   ¯15717240     5045040
 ¯29400     1128960   ¯10584000    40320000   ¯72765000    62092800   ¯20180160
  48510    ¯1940400    18711000   ¯72765000   133402500  ¯115259760    37837800
 ¯38808     1596672   ¯15717240    62092800  ¯115259760   100590336   ¯33297264
  12012     ¯504504     5045040   ¯20180160    37837800   ¯33297264    11099088


      FSEQ
                                1
                               12
                             2160
                          6048000
                     2667168000000
            18631342033920000000
   20679090479257706496000000
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