TABLE FOR UPPER PERCENTAGE POINTS OF THE LARGEST ROOT OF A DETERMINANTAL EQUATION WITH FIVE ROOTS

By William W. Chen

The distribution of the non-null characteristic roots of a matrix derived from sample observations taken from multivariate normal populations is fundamental importance in multivariate analysis. The Fisher-Girshick-Hsu-Roy distribution(1939), which has interested statisticians more than six decades, is revisited. Instead of using Pillai's K.C.S. method by neglecting higher order terms of the cumulative distribution function(c.d.f.) of the largest root to approximate the percentage points, we simply keep the whole c.d.f. and apply its natural nondecreasing property to calculate the exact probabilities. At the duplicated percentage points we found our computed percentage points consistent to the existing tables. However our tabulations have greatly extended the existing tables.

Key words : Characteristic roots, extended tables, Fisher-Girshick-Hsu-Roy Distribution, Percentage points.

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1. INTRODUCTION

We are concerned here with the distribution of the largest characteristic roots in multivariate analysis when there are five roots. Fisher-Girshick-Hsu-Roy(1939) discusses this in detail and presents the exact joint probability density function in general. This well-known distribution depends on the number of characteristic roots and two parameters m and n. They are defined differently for various situations as described by Pillai (1955). The upper percentage points of the distribution are commonly used in three different types of hypothesis testing in multivariate analysis, namely, i. test of equality of the variance-covariance matrices of two p-variate normal population, ii. test of equality of the p-dimensional mean vectors for k p-variate normal populations and iii. test of independence between a p-set and a q-set of variates in a (p+q)-variate normal population. When the null hypotheses to be tested are true, all the three types of test proposed above have been shown to depend only on the characteristic roots of matrices using observed samples. We could state the problem in the following manner. Using a random sample from the multivariate normal population we could compute the characteristic roots from a usual sum of product matrices of this sample. We then compare the largest characteristic root of the matrices with the percentage points that we have tabulated in this paper to determine whether or not to reject the null hypothesis at a certain probability confidence. For this reason the percentage points of the largest characteristic roots of the distribution has deeply attracted the attention of mathematical statistician more than six decades. There already has many published tables that either focus on upper percentage points tabulations or chart the various sizes of roots. Pillai is the most well known contributor in this area. He gave the general rules of finding the C.D.F. of the largest root and tabulated upper percentage points of 95% and 99% for various sizes of roots. Other contributors including Nanda (1948, 1951), Foster (1957, 1958), Rees (1957), and Heck (1960) will be discussed in more detail in section 2. In section 3 we give the joint distribution of s non-null characteristic roots of a matrix in general form and the C.D.F. of the fifth largest characteristic root. In section 4 we discuss in detail the algorithm we used to create the tables of this paper. In section 5 we compare Pillai's method with ours and also the advantage we have in our approach.

2. CUMULATIVE FUNCTION AND HISTORICAL WORK

The joint distribution of s non-null characteristic roots of a matrix in multivariate distribution was given by Fisher-Girshick-Hsu-Roy(1939). This distribution can be expressed in the form of (3.1). In this study we interested in the distribution of the largest characteristic root with the five roots. Even through we know the form of the joint density function it may not easy to write out its C.D.F. of the largest characteristic root. To solve this problem, there are two methods that could lead us to find the C.D.F. more easily. Pillai (1965) suggested that the C.D.F. of the largest characteristic root could be presented in determinantal form of incomplete beta functions. To overcome the difficulty of numerical integration of each of the s! multiple integrals when the determinant is expanded, he has suggested an alternative reduction formula. This formula gives exact expressions for the C.D.F. of the largest root in terms of incomplete beta functions or functions of incomplete beta functions for various values of s. Later, Pillai(1956a) expanded C.D.F. by neglecting higher order terms and tabulated the 95% and 99% percentage points. An alternative method suggested by Nanda (1948) yield the same results. He started with the Vandermonde determinant and expanded the determinant in minors of a row then repeated applied integration by part to find the C.D.F. of largest characteristics root. In this paper we slightly modified Nanda's notation and presented the case with five roots in equation (3.2). Following this C.D.F. and the algorithm described in section 4 we could tabulate the upper percentage points.

At this moment it is useful to review some of the published tables and sees some reasons to extend the tables. Pillai (1956a, 1959) published tables that focus only on two percentage points i.e. 95% and 99% for s =2,6, m = 0(1)4, and n varying from 5 to 1000. Foster and Rees' (1957), have tabulated the upper percentage points 80%, 85%, 90%, 95% and 99%,of the largest root for s=2, m=-0.5, 0(1)9, n=1(1)19(5)49,59, 79. Foster(1957, 1958) has further extended these tables for values of s=3 and 4. Heck(1960) has given some charts of upper 95%, 97.5% and 99% points for s=2(1)5, m=-0.5, 0(1)10 and n greater than 4. Recently Rencher (reference [18],[19] and [20]) included the percentage point 0.950 in all of the three references. In reference [18] ,page 518, he selected m = 0(1), 5,7,10,15 and N = 5(5),30(10),60(20),80,120,240. Same selection occurs in reference [20], page 575. In Reference [19] he choses m = -0.5,0(1),10,15 while N = 1(2),5(5),30(10), 50,100, 500,1000 in Table B.5 page 436. Rencher's excellent written textbook [18] gives a well known numerical example that demonstrates how to use these table values. In this example, four variables have selected to test its' significant difference : 'trunk girth at 4 years mmx100', 'extension growth at 4 years (m)', 'trunk girth at 15 years (mmx100) ', and 'weight of tree above ground at 15 years (lbx100)'. (For the detailed computational procedure, see reference [18], page 189.) Another excellent application can be found in reference [19] , a study that compared four groups of rabbits infected with human tuberculosis. Here, the four groups are 'unvaccinated control', 'infected during metabolic depression', 'infected during heightened metabolic activity', and 'infected during normal activity'. (The data and detailed computational procedure can be found in page 157, example 4.8.3.) These examples demonstrate how the research and applications in this area of study are still active.

At the early age without a modern computer, it is an understandable difficulty task to compute the whole C.D.F.(3.2) at each percentage points. This is not only tedious but also worthless. Therefore deleting higher order terms and keeping a few lower order terms to approximate the roots is a good and reasonable method to solve the problem. But this approach will involve intolerable error at the lower percentage points such as 80%,82.5%,85%,87.5%,90% or 92.5%. These percentage points usually are ignored not because of lack of use but because of difficulty of computation. Traditional methods treat missing values by interpolation. However without say 85% or 90% percentage points it is difficult to interpolate 87.5%. In recent years, the computer has gradually matured in memory, speed, and flexibility in usage. It has greatly changed the method we study the statistics. In this study we use one of the most basic properties of C.D.F. and revisit this most important distribution. We attempted to include as many percentage points as we needed in one computer run. The included upper percentage points are 0.80, 0.825, 0.850, 0.875, 0.890, 0.900, 0.910(0.005), 0.995. Different authors have selected different m and n parameter values. We selected these two parameters in such a way that all existed table values will include. For the parameter m=0(1)15 and the parameter n=1(1)20(2)30(5)80(10) 150,200(100)1000. Our table will give us the exact accuracy percentage points and probabilities and avoid the interpolation problem.

3. THE DISTRIBUTION FUNCTION OF FIFTH CHARACTERISTICS ROOT

The joint distribution of s non-null characteristic roots of a matrix in multivariate analysis given by Fisher-Girshick-Shu-Roy(1939) can be written as

$$f(\theta_1,....\theta_s) = C(s,m,n)\prod_{i=1}^{s}\theta_i^m(1-\theta_i)^n\prod_{i>j}(\theta_i-\theta_j) \qquad (0<\theta_1\le....\le\theta_s\le 1),$$

where

$$C(s,m,n) = \frac{\pi^{s/2}\prod_{i=1}^{s}\Gamma(\frac{2m+2n+s+i+2}{2})}{\prod_{i=1}^{s}\Gamma(\frac{2m+i+1}{2})\Gamma(\frac{2n+i+1}{2})\Gamma(\frac{i}{2})}. \qquad (3.1)$$

and the parameter m and n are defined differently for various situations as described by Pillai (1955,pp 118). Following the Nanda (1948), repeated integration by part method, the cumulative distribution function of the largest characteristic root for S=5 is given below:

$$\Pr(\theta_5 \le x)$$
$$= \frac{C(5,m,n)}{m+n+5}[-x^{m+4}(1-x)^{n+1} * seq\_04321x(x,m,n)$$
$$-2\int_0^x t^{2m+4}(1-t)^{2n+1}dt * seq\_0321x(x,m+1,n) + \frac{2\int_0^x t^{2m+5}(1-t)^{2n+1}dt}{m+n+4}$$
$$\{\frac{-IO(x,m+3,n+1)}{m+n+3}[-x^{m+2}(1-x)^{n+1} * \int_0^x t^m(1-t)^n dt + 2\int_0^x t^{2m+2}(1-t)^{2n+1}dt$$
$$+(m+2) * seq\_021x(x,m,n)] - 2I(x,2m+3,2n+1) * V(x,m+2,n) \tag{3.2}$$
$$+2I(x,2m+5,2n+1) * V(x,m,n)\} - \frac{2\int_0^x t^{2m+6}(1-t)^{2n+1}dt}{m+n+4}$$
$$\{-IO(x,m+3,n+1) * seq\_021x(x,m,n) - 2I(x,2m+3,2n+1) * V(x,m+1,n)$$
$$+2I(x,2m+4,2n+1) * V(x,m,n) + (m+3) * seq\_0321x(x,m,n)\}$$
$$+2\int_0^x t^{2m+7}(1-t)^{2n+1}dt * seq\_0321x(x,m,n)]$$

All the symbols used in above equation are defined as follows.

$$V(x,m,n) = \int_0^x t^m(1-t)^n dt$$
$$IO(x,m+3,n+1) = x^{m+3}(1-x)^{n+1} \tag{3.3}$$
$$I(x,m,n) = \int_0^x t^m(1-t)^n dt$$

$$seq\_021x(x,m,n)$$
$$= \frac{1}{(m+n+2)}[-x^{m+1}(1-x)^{n+1}\int_0^x t^m(1-t)^n dt + 2\int_0^x t^{2m+1}(1-t)^{2n+1}dt] \tag{3.4}$$

$$seq\_0321x(x,m,n)$$
$$= \frac{1}{m+n+3}\{-x^{m+2}(1-x)^{n+1} * seq\_021x(x,m,n)$$
$$-2\int_0^x t^{2m+2}(1-t)^{2n+1}dt\int_0^x t^{m+1}(1-t)^n dt + 2\int_0^x t^{2m+3}(1-t)^{2n+1}dt\int_0^x t^m(1-t)^n dt\} \tag{3.5}$$

$$\begin{aligned}
&seq_04321x(x,m,n)\\
&=\frac{1}{m+n+4}\{-x^{m+3}(1-x)^{n+1}seq_0321x(x,m,n)+2\int_0^x t^{2m+3}(1-t)^{2n+1}dt*seq_021x(x,m+1,n)\\
&\quad-\frac{2\int_0^x t^{2m+4}(1-t)^{2n+1}dt}{m+n+3}[-x^{m+2}(1-x)^{n+1}*\int_0^x t^m(1-t)^n dt+2\int_0^x t^{2m+2}(1-t)^{2n+1}dt\\
&\quad+(m+2)*seq_021x(x,m,n)]+2\int_0^x t^{2m+5}(1-t)^{2n+1}dt*seq_021x(x,m,n)\}
\end{aligned}\tag{3.6}$$

$$C(5,m,n)=\frac{\pi^{5/2}\prod_{i=1}^{5}\Gamma(\frac{2m+2n+7+i}{2})}{\prod_{i=1}^{5}\Gamma(\frac{2m+i+1}{2})\Gamma(\frac{2n+i+1}{2})\Gamma(\frac{i}{2})}$$

$$=\frac{\Gamma(2m+2n+8)\Gamma(2m+2n+5)\Gamma(2m+2n+11)}{192*\Gamma(2m+2)\Gamma(2n+2)\Gamma(2m+4)\Gamma(2n+4)\Gamma(m+3)\Gamma(n+3)}\tag{3.7}$$

4. THE ALGORITHM

In this section we describe in more detail how we compute the percentage points. In this study no new theory created, instead we apply the fundamental nondecreasing function property of the C.D.F. i.e. if $x_1 \le x_2$ then $f(x_1) \le f(x_2)$. Applying this useful and simple property helps us to find all the needed percentage points. To create the tables, we first set up a calling program that includes the given starting values x, m, and n. Then we build up a subroutine and many subprograms. In the subroutine we code equation (3.2) and call a set of subfunctions. Each subfunction carries a function value that represents a value in the equations (3.3), (3.4), (3.5), (3.6) and (3.7). Finally, the computed values from subfunctions are substituted into equation (3.2) and produce a probability used to tabulate our table. Let us start with a standard procedure used in computer algorithms to see how we generate one percentage point. First choose one set of m and n values, say m = 1 and n =2, and a very small x value, say 0 or $0.1*10^{-4}$ to ensure that there are no missing percentage points we interested are larger than this value. Using these selected values, substitute into equation (3.2) to compute the probability cumulate to this selected x value. If the computed probability say equals 0.95000325 then write out this computed probability, m, n, and x values in a specified file, say f950.dat. Then loop the pointer back and add a very small amount on x, say $0.1 * 10^{-4}$, and again compute the probability. If this time the computed probability is 0.9600125 then write out this computed probability, m, n, and x values in a different specified file, say f960.dat. Since we know that the cumulative function is always nondecreasing and continuous it ensures us that any probability ranged from 0 to 1 will have chance to be reached at least once for some selected x values. It is possible for several specific x values round to the same probability. This means we could increase either m or n by a selected value and reset x to 0 or a small value again to repeat the process of adding a small amount to x to compute the corresponding probability. This process should continue until we fill all m by n tables. Our experience shows that for a chosen fixed m and n, as x increases by the above stated increment the computed probabilities also increases with multiple values rounding to the desired probability. The following simple rule has been adopted to select a triplet x, m and n for a desired probability. Let's say the desired probability y is p_0 and estimate x to reach this probability y is x_0 i.e $\Pr(\theta_5 \le x_0) = p_0$. We need to find a

pair say, $x_0^{'}$ and $x_0^{''}$ such that

$$\Pr(\theta_5 \le x_0^{'}) < p_0 < \Pr(\theta_5 \le x_0^{''})$$

We then can conclude by monotonicity that x_0, in the interval $(x_0^{'}, x_0^{''})$, is the desired estimated ordinate x and report in the attached table. In the attached table we have rounded our results to four decimal accurate places.

5. SOME CONCLUSION REMARKS

Pillai's approximation method by neglecting higher order terms has some limitations. Pillai(1954) has studied these limitations in more detail for the case s =2,3 and 4. The error of the approximation of the upper percentage points of the distribution is defined as the difference between the approximate and exact probabilities. Pillai's comparative study can obtain the following conclusions. 1. There is greater agreement between the probabilities for the approximate and exact cases in upper 99% points than in the 95%. 2. The difference between the approximate and exact probabilities in the upper 95% points occur in the fifth decimal place, that on rounding gives a difference of only one in the fourth decimal place. 3. If we fixed the parameter m as constant, the error of approximation increases slowly as the other parameter increased; such increase occurs only in the sixth decimal place or at most is unity in the fifth decimal place when rounding.

Pillai (1959) also concluded that the approximate formula is only appropriate for percentage points 95% or higher. It might be adequate for those percentage points slightly below the 95%. In application it is very clear that lower percentage points are needed. Using the algorithm suggested in section 4, we can compute any percentage points accurately. Since we used the whole distribution function not a truncated distribution. The table included in this paper is only a small portion of the table generated from computer. For the interested reader could write to author for more detailed tabulations.

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Upper percentage points of .800 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

n	m = 0	1	2	3	4	5	6	7
1	.9344	.9489	.9581	.9644	.9691	.9727	.9756	.9779
2	.8732	.8982	.9149	.9268	.9358	.9428	.9484	.9530
3	.8129	.8462	.8693	.8862	.8992	.9096	.9179	.9249
4	.7571	.7966	.8247	.8458	.8623	.8755	.8864	.8956
5	.7067	.7505	.7824	.8069	.8263	.8420	.8552	.8662
6	.6615	.7082	.7430	.7701	.7918	.8097	.8247	.8375
7	.6211	.6697	.7066	.7356	.7593	.7789	.7955	.8097
8	.5849	.6347	.6730	.7036	.7287	.7497	.7677	.7831
9	.5525	.6028	.6421	.6738	.7000	.7222	.7412	.7577
10	.5232	.5738	.6136	.6461	.6732	.6963	.7162	.7335
11	.4968	.5472	.5873	.6203	.6481	.6719	.6925	.7106
12	.4728	.5229	.5631	.5964	.6246	.6489	.6701	.6888
13	.4510	.5005	.5406	.5741	.6027	.6274	.6490	.6681
14	.4310	.4799	.5198	.5533	.5821	.6071	.6290	.6486
15	.4127	.4609	.5005	.5339	.5627	.5879	.6102	.6300
16	.3958	.4433	.4825	.5158	.5446	.5699	.5923	.6123
17	.3802	.4269	.4657	.4988	.5275	.5528	.5754	.5956
18	.3658	.4117	.4500	.4828	.5114	.5368	.5593	.5797
19	.3525	.3975	.4353	.4678	.4963	.5215	.5441	.5645
20	.3400	.3842	.4215	.4537	.4819	.5071	.5297	.5501
22	.3176	.3601	.3963	.4277	.4556	.4804	.5029	.5233
24	.2979	.3388	.3739	.4046	.4318	.4564	.4786	.4989
26	.2805	.3199	.3539	.3837	.4104	.4345	.4564	.4765
28	.2650	.3030	.3358	.3649	.3910	.4146	.4362	.4561
30	.2511	.2877	.3195	.3478	.3733	.3964	.4177	.4373
35	.2220	.2555	.2849	.3113	.3352	.3572	.3774	.3962
40	.1989	.2297	.2570	.2816	.3041	.3249	.3442	.3621
45	.1801	.2087	.2341	.2571	.2783	.2979	.3162	.3334
50	.1646	.1911	.2149	.2365	.2565	.2751	.2925	.3088
55	.1515	.1763	.1986	.2189	.2378	.2554	.2720	.2876
60	.1404	.1636	.1846	.2038	.2217	.2384	.2542	.2691
65	.1308	.1526	.1724	.1906	.2076	.2235	.2385	.2528
70	.1224	.1430	.1617	.1790	.1952	.2103	.2247	.2384
75	.1150	.1345	.1523	.1688	.1841	.1986	.2124	.2255
80	.1084	.1270	.1439	.1596	.1743	.1882	.2014	.2139
90	.0974	.1142	.1296	.1440	.1575	.1702	.1824	.1940
100	.0883	.1038	.1179	.1311	.1436	.1554	.1667	.1775
110	.0809	.0951	.1082	.1204	.1319	.1429	.1535	.1636
120	.0745	.0877	.0999	.1113	.1221	.1323	.1422	.1516
130	.0691	.0814	.0928	.1034	.1135	.1232	.1324	.1413
140	.0644	.0760	.0866	.0966	.1061	.1152	.1239	.1324
150	.0604	.0712	.0812	.0907	.0996	.1082	.1165	.1244
200	.0458	.0542	.0620	.0693	.0763	.0830	.0895	.0958
300	.0310	.0367	.0420	.0471	.0519	.0566	.0612	.0656
400	.0234	.0277	.0318	.0357	.0394	.0430	.0465	.0499
500	.0188	.0223	.0256	.0287	.0317	.0346	.0375	.0402
600	.0157	.0186	.0214	.0240	.0265	.0290	.0314	.0337
700	.0135	.0160	.0184	.0206	.0228	.0249	.0270	.0290
800	.0118	.0140	.0161	.0181	.0200	.0219	.0237	.0255
900	.0105	.0125	.0143	.0161	.0178	.0195	.0211	.0227
1000	.0095	.0112	.0129	.0145	.0161	.0176	.0190	.0205

Upper percentage points of .800 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

n	m = 8	9	10	11	12	13	14	15
1	.9798	.9814	.9828	.9840	.9850	.9859	.9867	.9874
2	.9569	.9601	.9630	.9654	.9675	.9694	.9711	.9726
3	.9308	.9358	.9401	.9439	.9472	.9502	.9528	.9552
4	.9033	.9100	.9158	.9209	.9255	.9295	.9331	.9364
5	.8757	.8840	.8911	.8975	.9031	.9082	.9127	.9168
6	.8485	.8581	.8666	.8741	.8807	.8868	.8922	.8971
7	.8221	.8329	.8425	.8510	.8586	.8655	.8717	.8774
8	.7966	.8085	.8190	.8285	.8370	.8446	.8516	.8580
9	.7722	.7850	.7964	.8067	.8159	.8243	.8320	.8390
10	.7488	.7624	.7746	.7856	.7955	.8045	.8128	.8204
11	.7266	.7409	.7537	.7653	.7758	.7854	.7942	.8023
12	.7054	.7203	.7336	.7458	.7568	.7670	.7762	.7848
13	.6852	.7006	.7145	.7271	.7386	.7491	.7589	.7679
14	.6660	.6818	.6961	.7091	.7210	.7320	.7421	.7515
15	.6478	.6639	.6785	.6919	.7042	.7155	.7259	.7356
16	.6304	.6468	.6617	.6754	.6880	.6996	.7103	.7203
17	.6139	.6305	.6456	.6596	.6724	.6843	.6953	.7055
18	.5981	.6149	.6303	.6444	.6575	.6696	.6808	.6913
19	.5831	.6000	.6155	.6298	.6431	.6554	.6668	.6775
20	.5687	.5858	.6014	.6159	.6293	.6418	.6534	.6642
22	.5420	.5591	.5750	.5896	.6033	.6160	.6279	.6390
24	.5175	.5347	.5506	.5654	.5792	.5921	.6042	.6155
26	.4951	.5122	.5281	.5429	.5568	.5698	.5821	.5936
28	.4744	.4915	.5073	.5222	.5361	.5491	.5614	.5730
30	.4554	.4723	.4881	.5028	.5167	.5298	.5421	.5538
35	.4138	.4302	.4456	.4601	.4738	.4868	.4991	.5108
40	.3790	.3948	.4098	.4239	.4373	.4500	.4622	.4737
45	.3495	.3648	.3792	.3929	.4059	.4184	.4302	.4416
50	.3243	.3389	.3528	.3661	.3787	.3908	.4023	.4134
55	.3024	.3165	.3298	.3426	.3548	.3666	.3778	.3886
60	.2833	.2968	.3096	.3220	.3338	.3451	.3560	.3665
65	.2664	.2794	.2918	.3036	.3151	.3260	.3366	.3468
70	.2514	.2639	.2758	.2873	.2983	.3089	.3192	.3291
75	.2380	.2500	.2615	.2726	.2832	.2935	.3035	.3131
80	.2260	.2375	.2486	.2593	.2696	.2796	.2892	.2986
90	.2052	.2159	.2263	.2363	.2459	.2553	.2644	.2732
100	.1879	.1979	.2076	.2170	.2261	.2349	.2434	.2517
110	.1733	.1827	.1918	.2006	.2091	.2175	.2255	.2334
120	.1608	.1696	.1782	.1865	.1946	.2024	.2101	.2176
130	.1500	.1583	.1664	.1743	.1819	.1894	.1966	.2037
140	.1405	.1484	.1561	.1635	.1708	.1779	.1848	.1916
150	.1322	.1396	.1469	.1540	.1609	.1677	.1743	.1807
200	.1019	.1079	.1137	.1194	.1249	.1304	.1357	.1409
300	.0699	.0741	.0782	.0823	.0863	.0902	.0940	.0978
400	.0532	.0565	.0597	.0628	.0659	.0689	.0719	.0749
500	.0429	.0456	.0482	.0508	.0533	.0558	.0583	.0607
600	.0360	.0382	.0404	.0426	.0447	.0469	.0489	.0510
700	.0310	.0329	.0348	.0367	.0386	.0404	.0422	.0440
800	.0272	.0289	.0306	.0322	.0339	.0355	.0371	.0387
900	.0242	.0258	.0273	.0287	.0302	.0316	.0331	.0345
1000	.0219	.0232	.0246	.0259	.0273	.0286	.0299	.0311

Upper percentage points of .850 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

	m							
n	0	1	2	3	4	5	6	7
1	.9451	.9573	.9650	.9703	.9743	.9773	.9796	.9816
2	.8885	.9106	.9253	.9359	.9438	.9499	.9548	.9589
3	.8311	.8614	.8823	.8976	.9094	.9187	.9263	.9326
4	.7769	.8135	.8394	.8589	.8741	.8863	.8963	.9047
5	.7273	.7685	.7983	.8212	.8393	.8540	.8662	.8765
6	.6825	.7268	.7597	.7852	.8057	.8225	.8366	.8486
7	.6422	.6887	.7237	.7514	.7738	.7924	.8081	.8215
8	.6059	.6537	.6904	.7196	.7436	.7637	.7807	.7954
9	.5731	.6218	.6596	.6900	.7152	.7364	.7546	.7704
10	.5435	.5925	.6311	.6624	.6885	.7107	.7298	.7465
11	.5167	.5657	.6047	.6367	.6635	.6865	.7063	.7237
12	.4922	.5411	.5803	.6126	.6400	.6636	.6841	.7021
13	.4699	.5184	.5576	.5902	.6180	.6420	.6630	.6815
14	.4494	.4975	.5365	.5693	.5973	.6216	.6430	.6620
15	.4306	.4781	.5169	.5497	.5779	.6024	.6241	.6434
16	.4133	.4601	.4986	.5313	.5595	.5843	.6062	.6257
17	.3973	.4434	.4816	.5141	.5423	.5671	.5892	.6089
18	.3825	.4278	.4656	.4979	.5260	.5509	.5730	.5929
19	.3687	.4133	.4506	.4826	.5107	.5355	.5577	.5777
20	.3558	.3996	.4365	.4683	.4961	.5209	.5431	.5632
22	.3326	.3749	.4107	.4419	.4694	.4939	.5160	.5361
24	.3122	.3530	.3878	.4182	.4452	.4695	.4914	.5114
26	.2941	.3335	.3673	.3969	.4234	.4473	.4690	.4888
28	.2780	.3160	.3487	.3777	.4036	.4270	.4484	.4681
30	.2636	.3002	.3320	.3602	.3855	.4085	.4296	.4490
35	.2332	.2669	.2963	.3227	.3465	.3684	.3886	.4073
40	.2091	.2401	.2675	.2922	.3147	.3354	.3546	.3725
45	.1895	.2183	.2438	.2669	.2881	.3078	.3260	.3432
50	.1733	.2000	.2239	.2456	.2657	.2843	.3017	.3181
55	.1596	.1846	.2070	.2275	.2465	.2641	.2807	.2963
60	.1479	.1714	.1925	.2119	.2298	.2466	.2624	.2774
65	.1378	.1599	.1799	.1982	.2153	.2313	.2464	.2607
70	.1290	.1499	.1688	.1862	.2025	.2177	.2322	.2459
75	.1212	.1410	.1590	.1756	.1911	.2057	.2195	.2327
80	.1144	.1332	.1503	.1661	.1809	.1949	.2081	.2208
90	.1027	.1198	.1354	.1499	.1635	.1764	.1886	.2003
100	.0932	.1089	.1232	.1366	.1491	.1610	.1724	.1833
110	.0853	.0998	.1130	.1254	.1371	.1482	.1588	.1690
120	.0787	.0921	.1044	.1159	.1268	.1372	.1471	.1567
130	.0730	.0855	.0970	.1078	.1180	.1278	.1371	.1461
140	.0681	.0798	.0906	.1007	.1103	.1195	.1283	.1368
150	.0638	.0748	.0850	.0945	.1036	.1123	.1206	.1287
200	.0484	.0569	.0648	.0723	.0794	.0862	.0927	.0991
300	.0327	.0385	.0440	.0491	.0541	.0588	.0634	.0679
400	.0247	.0291	.0333	.0372	.0410	.0446	.0482	.0516
500	.0198	.0234	.0268	.0299	.0330	.0360	.0388	.0416
600	.0166	.0196	.0224	.0251	.0276	.0301	.0325	.0349
700	.0142	.0168	.0192	.0215	.0238	.0259	.0280	.0300
800	.0125	.0147	.0169	.0189	.0208	.0227	.0246	.0264
900	.0111	.0131	.0150	.0168	.0186	.0202	.0219	.0235
1000	.0100	.0118	.0135	.0152	.0167	.0183	.0197	.0212

Upper percentage points of .850 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

	m							
n	8	9	10	11	12	13	14	15
1	.9832	.9845	.9856	.9866	.9875	.9882	.9889	.9895
2	.9623	.9651	.9676	.9697	.9716	.9733	.9747	.9761
3	.9378	.9424	.9463	.9497	.9527	.9553	.9577	.9598
4	.9118	.9179	.9232	.9279	.9321	.9357	.9390	.9420
5	.8853	.8929	.8996	.9054	.9107	.9153	.9196	.9234
6	.8589	.8679	.8758	.8828	.8891	.8947	.8997	.9043
7	.8332	.8434	.8524	.8604	.8676	.8741	.8799	.8853
8	.8082	.8195	.8295	.8384	.8465	.8537	.8603	.8664
9	.7842	.7964	.8073	.8171	.8259	.8338	.8411	.8478
10	.7612	.7742	.7858	.7963	.8058	.8144	.8223	.8296
11	.7391	.7529	.7652	.7763	.7864	.7956	.8041	.8118
12	.7181	.7324	.7453	.7570	.7677	.7774	.7863	.7945
13	.6981	.7129	.7263	.7385	.7496	.7598	.7691	.7778
14	.6789	.6942	.7080	.7206	.7322	.7428	.7525	.7616
15	.6607	.6763	.6905	.7035	.7154	.7264	.7365	.7459
16	.6433	.6593	.6738	.6871	.6993	.7105	.7210	.7307
17	.6267	.6429	.6577	.6713	.6838	.6953	.7060	.7160
18	.6109	.6273	.6423	.6561	.6688	.6806	.6916	.7018
19	.5958	.6124	.6276	.6416	.6545	.6665	.6776	.6881
20	.5814	.5981	.6134	.6276	.6407	.6529	.6642	.6748
22	.5545	.5713	.5868	.6012	.6146	.6271	.6387	.6496
24	.5298	.5467	.5623	.5769	.5904	.6031	.6149	.6261
26	.5071	.5240	.5397	.5543	.5679	.5807	.5927	.6041
28	.4862	.5030	.5187	.5333	.5470	.5599	.5720	.5834
30	.4669	.4836	.4992	.5138	.5275	.5404	.5526	.5641
35	.4247	.4410	.4562	.4706	.4842	.4970	.5092	.5207
40	.3893	.4050	.4199	.4339	.4472	.4599	.4719	.4833
45	.3593	.3745	.3888	.4025	.4154	.4278	.4396	.4508
50	.3335	.3481	.3620	.3752	.3878	.3998	.4113	.4223
55	.3111	.3252	.3386	.3513	.3635	.3752	.3864	.3971
60	.2916	.3051	.3180	.3303	.3421	.3534	.3643	.3747
65	.2743	.2873	.2997	.3116	.3230	.3340	.3445	.3547
70	.2590	.2714	.2834	.2949	.3059	.3166	.3268	.3367
75	.2452	.2572	.2688	.2799	.2906	.3009	.3108	.3204
80	.2329	.2445	.2556	.2663	.2766	.2866	.2963	.3056
90	.2115	.2223	.2327	.2428	.2525	.2618	.2709	.2798
100	.1938	.2039	.2136	.2230	.2321	.2410	.2496	.2579
110	.1788	.1882	.1974	.2062	.2148	.2232	.2313	.2392
120	.1659	.1748	.1834	.1918	.1999	.2078	.2155	.2230
130	.1548	.1632	.1713	.1792	.1869	.1944	.2018	.2089
140	.1450	.1530	.1607	.1682	.1755	.1827	.1896	.1964
150	.1364	.1440	.1513	.1585	.1655	.1722	.1789	.1854
200	.1053	.1113	.1172	.1229	.1285	.1340	.1394	.1446
300	.0723	.0765	.0807	.0848	.0888	.0928	.0966	.1005
400	.0550	.0583	.0615	.0647	.0678	.0709	.0740	.0770
500	.0444	.0471	.0497	.0523	.0549	.0574	.0599	.0624
600	.0372	.0395	.0417	.0439	.0461	.0482	.0503	.0524
700	.0320	.0340	.0359	.0378	.0397	.0416	.0434	.0452
800	.0281	.0299	.0316	.0332	.0349	.0365	.0381	.0397
900	.0251	.0266	.0281	.0296	.0311	.0326	.0340	.0355
1000	.0226	.0240	.0254	.0267	.0281	.0294	.0307	.0320

Upper percentage points of .900 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

n	m = 0	1	2	3	4	5	6	7
1	.9568	.9664	.9725	.9767	.9798	.9822	.9840	.9856
2	.9062	.9249	.9373	.9462	.9529	.9580	.9622	.9656
3	.8526	.8793	.8976	.9111	.9213	.9295	.9361	.9415
4	.8008	.8338	.8571	.8746	.8882	.8991	.9080	.9155
5	.7526	.7903	.8177	.8385	.8550	.8684	.8794	.8888
6	.7085	.7497	.7802	.8038	.8226	.8381	.8511	.8621
7	.6684	.7121	.7449	.7707	.7916	.8089	.8234	.8359
8	.6321	.6774	.7120	.7395	.7620	.7808	.7968	.8105
9	.5991	.6455	.6814	.7102	.7340	.7541	.7712	.7860
10	.5691	.6161	.6529	.6828	.7076	.7287	.7468	.7626
11	.5418	.5891	.6265	.6571	.6827	.7046	.7236	.7401
12	.5168	.5641	.6019	.6330	.6593	.6819	.7015	.7187
13	.4940	.5411	.5790	.6105	.6373	.6603	.6805	.6983
14	.4730	.5198	.5577	.5894	.6165	.6400	.6605	.6788
15	.4536	.5000	.5378	.5696	.5969	.6207	.6416	.6602
16	.4358	.4816	.5192	.5510	.5785	.6024	.6236	.6425
17	.4192	.4644	.5018	.5336	.5610	.5852	.6066	.6257
18	.4038	.4484	.4855	.5171	.5446	.5688	.5903	.6096
19	.3895	.4335	.4701	.5016	.5290	.5532	.5748	.5943
20	.3762	.4194	.4557	.4869	.5142	.5384	.5601	.5797
22	.3520	.3939	.4293	.4600	.4870	.5110	.5327	.5524
24	.3307	.3712	.4057	.4357	.4623	.4862	.5078	.5274
26	.3118	.3510	.3845	.4139	.4400	.4636	.4849	.5045
28	.2950	.3328	.3654	.3941	.4197	.4429	.4640	.4834
30	.2798	.3164	.3480	.3760	.4012	.4239	.4448	.4639
35	.2479	.2816	.3111	.3373	.3611	.3829	.4029	.4214
40	.2225	.2537	.2811	.3058	.3283	.3489	.3680	.3858
45	.2018	.2308	.2564	.2796	.3008	.3204	.3387	.3558
50	.1847	.2116	.2357	.2575	.2776	.2962	.3136	.3300
55	.1702	.1954	.2180	.2386	.2577	.2754	.2920	.3076
60	.1578	.1815	.2028	.2223	.2404	.2573	.2731	.2881
65	.1471	.1694	.1896	.2081	.2253	.2414	.2565	.2709
70	.1377	.1589	.1780	.1956	.2119	.2273	.2418	.2556
75	.1295	.1495	.1677	.1845	.2001	.2148	.2287	.2419
80	.1222	.1412	.1585	.1745	.1895	.2036	.2169	.2297
90	.1098	.1271	.1429	.1576	.1713	.1843	.1967	.2085
100	.0997	.1156	.1301	.1436	.1564	.1684	.1799	.1909
110	.0913	.1060	.1194	.1320	.1438	.1550	.1657	.1760
120	.0842	.0978	.1103	.1220	.1331	.1436	.1536	.1633
130	.0781	.0908	.1025	.1135	.1238	.1337	.1432	.1523
140	.0728	.0848	.0958	.1061	.1158	.1251	.1340	.1426
150	.0682	.0795	.0898	.0995	.1088	.1176	.1260	.1342
200	.0519	.0606	.0686	.0762	.0834	.0903	.0969	.1034
300	.0351	.0410	.0466	.0518	.0568	.0617	.0663	.0709
400	.0265	.0310	.0352	.0393	.0431	.0468	.0504	.0539
500	.0213	.0249	.0284	.0316	.0347	.0377	.0407	.0435
600	.0178	.0208	.0237	.0264	.0291	.0316	.0341	.0365
700	.0153	.0179	.0204	.0227	.0250	.0272	.0293	.0314
800	.0134	.0157	.0179	.0199	.0219	.0239	.0257	.0276
900	.0119	.0140	.0159	.0178	.0195	.0212	.0229	.0246
1000	.0107	.0126	.0143	.0160	.0176	.0192	.0207	.0221

Upper percentage points of .900 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

n	m = 8	9	10	11	12	13	14	15
1	.9868	.9879	.9888	.9895	.9902	.9908	.9913	.9918
2	.9684	.9708	.9729	.9747	.9763	.9776	.9789	.9800
3	.9461	.9501	.9534	.9564	.9590	.9613	.9634	.9652
4	.9218	.9273	.9320	.9362	.9399	.9431	.9461	.9487
5	.8967	.9036	.9097	.9150	.9197	.9239	.9277	.9312
6	.8716	.8798	.8870	.8934	.8991	.9043	.9089	.9131
7	.8467	.8562	.8645	.8719	.8785	.8845	.8899	.8948
8	.8225	.8330	.8423	.8506	.8581	.8649	.8710	.8766
9	.7990	.8105	.8207	.8298	.8381	.8456	.8524	.8586
10	.7764	.7887	.7997	.8096	.8185	.8267	.8341	.8409
11	.7547	.7678	.7794	.7900	.7995	.8082	.8162	.8235
12	.7340	.7476	.7599	.7710	.7811	.7903	.7988	.8066
13	.7141	.7283	.7411	.7527	.7633	.7730	.7819	.7901
14	.6951	.7097	.7230	.7350	.7461	.7562	.7655	.7742
15	.6769	.6920	.7056	.7181	.7295	.7400	.7497	.7586
16	.6595	.6749	.6889	.7017	.7135	.7243	.7343	.7436
17	.6430	.6586	.6729	.6860	.6980	.7092	.7195	.7290
18	.6271	.6430	.6575	.6709	.6832	.6945	.7051	.7149
19	.6120	.6280	.6428	.6563	.6688	.6804	.6912	.7013
20	.5975	.6137	.6286	.6423	.6550	.6668	.6778	.6881
22	.5703	.5867	.6019	.6159	.6289	.6410	.6524	.6630
24	.5454	.5619	.5772	.5914	.6046	.6170	.6285	.6394
26	.5224	.5390	.5544	.5687	.5820	.5945	.6063	.6173
28	.5012	.5178	.5332	.5475	.5610	.5736	.5854	.5966
30	.4817	.4981	.5135	.5278	.5413	.5540	.5659	.5772
35	.4386	.4547	.4698	.4840	.4974	.5101	.5221	.5334
40	.4025	.4181	.4329	.4468	.4599	.4724	.4843	.4956
45	.3718	.3869	.4012	.4147	.4276	.4398	.4515	.4626
50	.3454	.3599	.3738	.3869	.3994	.4113	.4228	.4337
55	.3224	.3364	.3498	.3625	.3746	.3863	.3974	.4081
60	.3023	.3158	.3287	.3410	.3527	.3640	.3749	.3853
65	.2845	.2975	.3099	.3218	.3332	.3442	.3547	.3649
70	.2687	.2812	.2932	.3047	.3157	.3264	.3366	.3465
75	.2546	.2666	.2782	.2893	.3000	.3103	.3202	.3298
80	.2418	.2534	.2646	.2754	.2857	.2957	.3054	.3147
90	.2198	.2306	.2411	.2511	.2609	.2703	.2794	.2882
100	.2014	.2116	.2214	.2308	.2400	.2489	.2575	.2659
110	.1859	.1954	.2046	.2135	.2222	.2306	.2387	.2467
120	.1726	.1815	.1902	.1987	.2068	.2148	.2225	.2301
130	.1610	.1695	.1777	.1857	.1935	.2010	.2084	.2155
140	.1509	.1590	.1668	.1743	.1817	.1889	.1959	.2027
150	.1420	.1497	.1571	.1643	.1713	.1782	.1848	.1914
200	.1097	.1158	.1217	.1275	.1331	.1387	.1441	.1494
300	.0753	.0796	.0839	.0880	.0921	.0961	.1000	.1039
400	.0574	.0607	.0640	.0672	.0704	.0735	.0766	.0796
500	.0463	.0490	.0517	.0544	.0570	.0595	.0620	.0645
600	.0388	.0411	.0434	.0456	.0478	.0500	.0521	.0543
700	.0334	.0354	.0374	.0393	.0412	.0431	.0450	.0468
800	.0294	.0311	.0328	.0345	.0362	.0379	.0395	.0411
900	.0262	.0277	.0293	.0308	.0323	.0338	.0353	.0367
1000	.0236	.0250	.0264	.0278	.0292	.0305	.0318	.0331

Upper percentage points of .915 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

	m							
n	0	1	2	3	4	5	6	7
1	.9607	.9694	.9750	.9788	.9816	.9838	.9855	.9869
2	.9122	.9298	.9414	.9497	.9560	.9608	.9647	.9679
3	.8601	.8855	.9030	.9157	.9255	.9332	.9395	.9447
4	.8093	.8410	.8634	.8801	.8932	.9036	.9122	.9193
5	.7617	.7982	.8246	.8447	.8606	.8735	.8842	.8932
6	.7179	.7580	.7876	.8104	.8287	.8437	.8563	.8669
7	.6780	.7206	.7526	.7777	.7980	.8148	.8290	.8411
8	.6417	.6860	.7199	.7468	.7687	.7871	.8026	.8160
9	.6086	.6542	.6894	.7176	.7409	.7605	.7773	.7917
10	.5785	.6248	.6609	.6903	.7146	.7353	.7530	.7684
11	.5511	.5977	.6345	.6646	.6898	.7113	.7299	.7461
12	.5260	.5727	.6099	.6406	.6664	.6886	.7079	.7248
13	.5029	.5495	.5870	.6180	.6444	.6671	.6869	.7044
14	.4818	.5281	.5656	.5969	.6236	.6467	.6670	.6850
15	.4622	.5081	.5456	.5770	.6040	.6274	.6481	.6664
16	.4442	.4896	.5269	.5584	.5855	.6092	.6301	.6488
17	.4274	.4723	.5094	.5408	.5680	.5918	.6130	.6319
18	.4118	.4561	.4929	.5242	.5515	.5754	.5967	.6158
19	.3974	.4410	.4775	.5086	.5358	.5598	.5812	.6005
20	.3838	.4269	.4629	.4939	.5210	.5450	.5665	.5858
22	.3593	.4010	.4362	.4667	.4935	.5174	.5389	.5584
24	.3377	.3781	.4124	.4423	.4687	.4924	.5138	.5333
26	.3185	.3576	.3910	.4202	.4463	.4697	.4909	.5103
28	.3014	.3392	.3716	.4002	.4258	.4488	.4698	.4891
30	.2860	.3225	.3541	.3820	.4070	.4297	.4505	.4695
35	.2535	.2872	.3166	.3429	.3666	.3883	.4082	.4267
40	.2276	.2588	.2863	.3109	.3334	.3540	.3731	.3909
45	.2065	.2355	.2612	.2844	.3056	.3252	.3434	.3605
50	.1890	.2160	.2401	.2620	.2821	.3007	.3181	.3344
55	.1742	.1995	.2222	.2428	.2619	.2796	.2962	.3119
60	.1615	.1854	.2067	.2263	.2444	.2613	.2772	.2921
65	.1506	.1731	.1933	.2118	.2291	.2452	.2604	.2747
70	.1410	.1623	.1815	.1991	.2155	.2309	.2455	.2593
75	.1326	.1528	.1710	.1878	.2035	.2183	.2322	.2454
80	.1252	.1443	.1617	.1778	.1928	.2069	.2203	.2330
90	.1125	.1299	.1458	.1605	.1743	.1874	.1998	.2116
100	.1021	.1181	.1328	.1463	.1591	.1712	.1827	.1937
110	.0935	.1083	.1218	.1344	.1463	.1576	.1684	.1787
120	.0863	.1000	.1126	.1243	.1354	.1460	.1561	.1658
130	.0800	.0929	.1046	.1157	.1261	.1360	.1455	.1546
140	.0747	.0867	.0977	.1081	.1179	.1272	.1362	.1448
150	.0700	.0813	.0917	.1015	.1107	.1196	.1281	.1362
200	.0532	.0619	.0700	.0776	.0849	.0918	.0986	.1050
300	.0360	.0420	.0475	.0528	.0579	.0627	.0675	.0720
400	.0272	.0317	.0360	.0400	.0439	.0477	.0513	.0548
500	.0218	.0255	.0290	.0322	.0354	.0384	.0414	.0442
600	.0182	.0213	.0242	.0270	.0296	.0322	.0347	.0371
700	.0157	.0183	.0208	.0232	.0255	.0277	.0298	.0319
800	.0137	.0161	.0183	.0203	.0223	.0243	.0262	.0280
900	.0122	.0143	.0163	.0181	.0199	.0216	.0233	.0250
1000	.0110	.0129	.0146	.0163	.0179	.0195	.0210	.0225

Upper percentage points of .915 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

n	m = 8	9	10	11	12	13	14	15
1	.9880	.9890	.9898	.9905	.9911	.9916	.9921	.9925
2	.9705	.9728	.9747	.9764	.9778	.9791	.9803	.9813
3	.9490	.9527	.9559	.9588	.9612	.9634	.9654	.9671
4	.9254	.9306	.9351	.9391	.9426	.9457	.9485	.9511
5	.9008	.9075	.9133	.9184	.9229	.9270	.9306	.9339
6	.8761	.8840	.8910	.8972	.9027	.9077	.9122	.9162
7	.8516	.8608	.8688	.8760	.8825	.8882	.8935	.8983
8	.8276	.8379	.8470	.8550	.8623	.8689	.8749	.8803
9	.8044	.8156	.8256	.8345	.8425	.8498	.8564	.8625
10	.7820	.7940	.8048	.8144	.8232	.8311	.8383	.8450
11	.7604	.7732	.7846	.7950	.8043	.8128	.8206	.8278
12	.7398	.7532	.7652	.7761	.7860	.7951	.8034	.8110
13	.7200	.7339	.7465	.7579	.7683	.7778	.7866	.7947
14	.7010	.7154	.7285	.7403	.7512	.7611	.7703	.7788
15	.6829	.6977	.7111	.7234	.7346	.7450	.7545	.7633
16	.6655	.6807	.6945	.7071	.7187	.7293	.7392	.7484
17	.6490	.6644	.6785	.6914	.7033	.7143	.7244	.7339
18	.6331	.6488	.6631	.6763	.6885	.6997	.7101	.7198
19	.6179	.6338	.6484	.6618	.6741	.6856	.6963	.7062
20	.6034	.6195	.6342	.6478	.6604	.6720	.6829	.6930
22	.5762	.5925	.6075	.6213	.6342	.6462	.6574	.6679
24	.5512	.5676	.5827	.5968	.6099	.6221	.6336	.6443
26	.5281	.5446	.5598	.5740	.5873	.5997	.6113	.6223
28	.5068	.5233	.5386	.5528	.5661	.5787	.5904	.6015
30	.4872	.5035	.5188	.5330	.5464	.5590	.5708	.5820
35	.4439	.4599	.4749	.4891	.5024	.5150	.5269	.5382
40	.4075	.4231	.4377	.4516	.4647	.4771	.4889	.5002
45	.3765	.3916	.4058	.4193	.4321	.4443	.4560	.4671
50	.3498	.3644	.3782	.3913	.4038	.4157	.4271	.4380
55	.3267	.3407	.3540	.3667	.3788	.3904	.4015	.4122
60	.3063	.3198	.3327	.3450	.3567	.3680	.3788	.3893
65	.2884	.3014	.3138	.3257	.3371	.3480	.3586	.3687
70	.2724	.2849	.2969	.3084	.3194	.3301	.3403	.3502
75	.2581	.2702	.2817	.2928	.3035	.3138	.3238	.3334
80	.2452	.2568	.2680	.2788	.2891	.2991	.3088	.3181
90	.2229	.2338	.2442	.2543	.2641	.2735	.2826	.2914
100	.2043	.2145	.2243	.2338	.2430	.2518	.2605	.2689
110	.1886	.1981	.2074	.2163	.2250	.2334	.2415	.2495
120	.1751	.1841	.1928	.2013	.2094	.2174	.2252	.2327
130	.1634	.1719	.1802	.1882	.1959	.2035	.2109	.2181
140	.1532	.1612	.1691	.1767	.1840	.1912	.1983	.2051
150	.1441	.1518	.1592	.1665	.1735	.1804	.1871	.1936
200	.1113	.1174	.1234	.1292	.1349	.1405	.1459	.1513
300	.0765	.0808	.0851	.0893	.0933	.0974	.1013	.1052
400	.0582	.0616	.0649	.0682	.0714	.0745	.0776	.0806
500	.0470	.0498	.0525	.0551	.0577	.0603	.0629	.0654
600	.0394	.0418	.0440	.0463	.0485	.0507	.0528	.0549
700	.0340	.0360	.0379	.0399	.0418	.0437	.0456	.0474
800	.0298	.0316	.0333	.0350	.0367	.0384	.0400	.0417
900	.0266	.0282	.0297	.0312	.0328	.0343	.0357	.0372
1000	.0240	.0254	.0268	.0282	.0296	.0309	.0322	.0336

Upper percentage points of .925 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

	m							
n	0	1	2	3	4	5	6	7
1	.9634	.9715	.9767	.9803	.9829	.9849	.9865	.9878
2	.9166	.9333	.9444	.9523	.9582	.9628	.9665	.9695
3	.8656	.8901	.9068	.9191	.9285	.9359	.9419	.9469
4	.8155	.8463	.8680	.8842	.8968	.9069	.9152	.9221
5	.7684	.8040	.8297	.8493	.8647	.8772	.8876	.8963
6	.7249	.7641	.7930	.8153	.8332	.8478	.8601	.8705
7	.6851	.7269	.7583	.7829	.8028	.8192	.8331	.8449
8	.6488	.6924	.7257	.7521	.7737	.7916	.8069	.8200
9	.6157	.6606	.6953	.7231	.7460	.7653	.7817	.7959
10	.5856	.6312	.6669	.6958	.7198	.7401	.7576	.7728
11	.5580	.6041	.6405	.6702	.6950	.7162	.7345	.7505
12	.5328	.5790	.6158	.6461	.6717	.6936	.7126	.7293
13	.5096	.5558	.5929	.6236	.6497	.6721	.6917	.7090
14	.4883	.5342	.5714	.6024	.6289	.6517	.6718	.6896
15	.4686	.5142	.5513	.5825	.6092	.6325	.6529	.6710
16	.4504	.4956	.5326	.5638	.5907	.6142	.6349	.6534
17	.4335	.4782	.5150	.5462	.5732	.5968	.6178	.6365
18	.4178	.4619	.4984	.5296	.5566	.5804	.6015	.6204
19	.4032	.4467	.4829	.5139	.5409	.5647	.5860	.6051
20	.3896	.4324	.4683	.4991	.5260	.5498	.5712	.5904
22	.3648	.4064	.4414	.4718	.4984	.5222	.5436	.5629
24	.3429	.3832	.4174	.4472	.4735	.4971	.5184	.5378
26	.3235	.3625	.3958	.4250	.4509	.4742	.4953	.5146
28	.3062	.3439	.3763	.4048	.4303	.4533	.4742	.4934
30	.2906	.3271	.3586	.3865	.4114	.4341	.4547	.4737
35	.2577	.2914	.3208	.3470	.3707	.3923	.4122	.4306
40	.2315	.2627	.2901	.3148	.3372	.3578	.3769	.3946
45	.2100	.2391	.2648	.2880	.3092	.3288	.3470	.3640
50	.1922	.2194	.2435	.2653	.2854	.3041	.3215	.3378
55	.1772	.2026	.2253	.2460	.2651	.2828	.2994	.3151
60	.1644	.1883	.2097	.2293	.2474	.2643	.2802	.2952
65	.1533	.1758	.1961	.2146	.2319	.2480	.2632	.2776
70	.1435	.1649	.1841	.2018	.2182	.2337	.2482	.2620
75	.1350	.1552	.1735	.1904	.2061	.2209	.2348	.2481
80	.1274	.1466	.1641	.1802	.1952	.2094	.2228	.2355
90	.1145	.1320	.1480	.1627	.1766	.1896	.2020	.2139
100	.1040	.1201	.1347	.1484	.1612	.1733	.1848	.1959
110	.0952	.1101	.1237	.1363	.1482	.1595	.1703	.1807
120	.0878	.1016	.1143	.1261	.1372	.1478	.1579	.1676
130	.0815	.0944	.1062	.1173	.1277	.1377	.1472	.1564
140	.0760	.0881	.0992	.1096	.1195	.1288	.1378	.1465
150	.0713	.0826	.0931	.1029	.1122	.1211	.1296	.1378
200	.0542	.0630	.0711	.0788	.0860	.0930	.0998	.1063
300	.0366	.0427	.0483	.0536	.0587	.0636	.0683	.0729
400	.0277	.0323	.0366	.0406	.0445	.0483	.0519	.0555
500	.0222	.0260	.0294	.0327	.0359	.0389	.0419	.0448
600	.0186	.0217	.0246	.0274	.0300	.0326	.0351	.0375
700	.0160	.0186	.0212	.0235	.0258	.0280	.0302	.0323
800	.0140	.0163	.0185	.0206	.0227	.0246	.0265	.0284
900	.0125	.0146	.0165	.0184	.0202	.0219	.0236	.0253
1000	.0112	.0131	.0149	.0166	.0182	.0198	.0213	.0228

Upper percentage points of .925 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

n	m 8	9	10	11	12	13	14	15
1	.9888	.9897	.9905	.9911	.9917	.9922	.9927	.9931
2	.9720	.9742	.9760	.9776	.9790	.9802	.9813	.9823
3	.9511	.9547	.9577	.9604	.9628	.9649	.9668	.9685
4	.9280	.9330	.9374	.9412	.9446	.9476	.9503	.9528
5	.9038	.9103	.9159	.9209	.9253	.9292	.9327	.9359
6	.8794	.8871	.8940	.9000	.9054	.9102	.9145	.9185
7	.8552	.8641	.8720	.8790	.8853	.8910	.8961	.9008
8	.8314	.8415	.8504	.8583	.8654	.8718	.8777	.8830
9	.8084	.8194	.8291	.8379	.8458	.8529	.8594	.8654
10	.7861	.7979	.8085	.8180	.8266	.8344	.8415	.8480
11	.7647	.7772	.7885	.7986	.8078	.8162	.8239	.8309
12	.7441	.7573	.7691	.7799	.7896	.7986	.8067	.8143
13	.7243	.7381	.7505	.7617	.7720	.7814	.7900	.7980
14	.7054	.7196	.7325	.7442	.7550	.7648	.7738	.7822
15	.6873	.7020	.7153	.7274	.7385	.7487	.7581	.7668
16	.6700	.6850	.6986	.7111	.7225	.7331	.7428	.7519
17	.6534	.6687	.6827	.6954	.7072	.7180	.7281	.7374
18	.6376	.6531	.6673	.6804	.6924	.7035	.7138	.7234
19	.6224	.6381	.6526	.6658	.6781	.6894	.7000	.7098
20	.6078	.6238	.6384	.6518	.6643	.6758	.6866	.6966
22	.5806	.5967	.6116	.6254	.6382	.6501	.6612	.6716
24	.5555	.5718	.5869	.6008	.6138	.6260	.6373	.6480
26	.5324	.5487	.5639	.5780	.5912	.6035	.6150	.6259
28	.5110	.5274	.5426	.5568	.5700	.5824	.5941	.6052
30	.4913	.5076	.5227	.5369	.5502	.5627	.5745	.5857
35	.4478	.4637	.4787	.4928	.5061	.5186	.5304	.5417
40	.4112	.4267	.4414	.4552	.4682	.4806	.4924	.5036
45	.3800	.3951	.4093	.4228	.4355	.4477	.4593	.4704
50	.3532	.3677	.3815	.3946	.4070	.4189	.4303	.4412
55	.3298	.3438	.3572	.3698	.3820	.3935	.4046	.4153
60	.3094	.3229	.3357	.3480	.3597	.3710	.3818	.3922
65	.2913	.3043	.3167	.3286	.3400	.3509	.3614	.3715
70	.2752	.2877	.2997	.3112	.3222	.3328	.3430	.3529
75	.2607	.2728	.2844	.2955	.3062	.3165	.3264	.3360
80	.2477	.2594	.2706	.2813	.2917	.3017	.3114	.3207
90	.2252	.2361	.2466	.2567	.2664	.2759	.2850	.2938
100	.2065	.2167	.2265	.2360	.2452	.2541	.2627	.2711
110	.1906	.2002	.2094	.2184	.2270	.2355	.2436	.2516
120	.1770	.1860	.1947	.2032	.2114	.2194	.2272	.2347
130	.1652	.1737	.1820	.1900	.1978	.2054	.2127	.2199
140	.1548	.1629	.1708	.1784	.1858	.1930	.2001	.2069
150	.1457	.1534	.1609	.1681	.1752	.1821	.1888	.1953
200	.1126	.1187	.1247	.1305	.1362	.1418	.1473	.1526
300	.0774	.0817	.0860	.0902	.0943	.0983	.1023	.1062
400	.0589	.0623	.0656	.0689	.0721	.0752	.0783	.0814
500	.0476	.0503	.0531	.0557	.0583	.0609	.0635	.0660
600	.0399	.0422	.0445	.0468	.0490	.0512	.0533	.0555
700	.0344	.0364	.0384	.0403	.0422	.0441	.0460	.0479
800	.0302	.0319	.0337	.0354	.0371	.0388	.0404	.0421
900	.0269	.0285	.0300	.0316	.0331	.0346	.0361	.0375
1000	.0243	.0257	.0271	.0285	.0299	.0312	.0326	.0339

Upper percentage points of .950 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

n	m = 0	1	2	3	4	5	6	7
1	.9708	.9773	.9814	.9843	.9864	.9880	.9892	.9903
2	.9289	.9432	.9527	.9594	.9645	.9684	.9715	.9741
3	.8815	.9032	.9181	.9289	.9372	.9437	.9490	.9534
4	.8338	.8617	.8814	.8960	.9074	.9165	.9240	.9302
5	.7882	.8210	.8447	.8627	.8768	.8883	.8978	.9058
6	.7456	.7822	.8091	.8299	.8465	.8600	.8713	.8809
7	.7063	.7457	.7752	.7983	.8169	.8323	.8452	.8563
8	.6702	.7117	.7432	.7681	.7884	.8054	.8197	.8321
9	.6372	.6801	.7131	.7395	.7613	.7795	.7951	.8085
10	.6069	.6507	.6849	.7125	.7354	.7547	.7714	.7858
11	.5791	.6235	.6585	.6870	.7109	.7311	.7486	.7639
12	.5536	.5983	.6339	.6631	.6876	.7087	.7269	.7429
13	.5301	.5749	.6108	.6405	.6657	.6873	.7061	.7227
14	.5084	.5531	.5892	.6193	.6449	.6670	.6864	.7035
15	.4883	.5328	.5690	.5993	.6252	.6477	.6675	.6850
16	.4697	.5139	.5500	.5805	.6066	.6294	.6495	.6674
17	.4524	.4962	.5322	.5627	.5890	.6120	.6324	.6506
18	.4363	.4796	.5154	.5459	.5723	.5954	.6160	.6345
19	.4213	.4641	.4996	.5300	.5564	.5797	.6004	.6191
20	.4072	.4495	.4847	.5150	.5414	.5647	.5855	.6043
22	.3817	.4228	.4574	.4873	.5135	.5368	.5577	.5767
24	.3592	.3991	.4329	.4623	.4882	.5114	.5323	.5513
26	.3391	.3778	.4108	.4396	.4652	.4882	.5090	.5280
28	.3211	.3586	.3908	.4190	.4442	.4669	.4876	.5065
30	.3049	.3413	.3726	.4003	.4250	.4474	.4678	.4866
35	.2707	.3044	.3337	.3598	.3834	.4049	.4246	.4428
40	.2434	.2747	.3021	.3267	.3491	.3696	.3885	.4061
45	.2210	.2502	.2759	.2991	.3203	.3399	.3580	.3750
50	.2024	.2297	.2539	.2758	.2959	.3145	.3319	.3482
55	.1867	.2123	.2351	.2558	.2749	.2927	.3093	.3249
60	.1732	.1973	.2188	.2385	.2567	.2736	.2895	.3045
65	.1616	.1843	.2047	.2234	.2407	.2569	.2721	.2865
70	.1514	.1729	.1923	.2101	.2266	.2421	.2567	.2705
75	.1424	.1628	.1813	.1983	.2141	.2289	.2429	.2562
80	.1344	.1539	.1715	.1877	.2028	.2171	.2305	.2433
90	.1209	.1386	.1547	.1696	.1835	.1967	.2092	.2211
100	.1098	.1261	.1409	.1547	.1676	.1798	.1914	.2026
110	.1006	.1156	.1294	.1422	.1542	.1656	.1765	.1869
120	.0928	.1068	.1196	.1315	.1428	.1535	.1637	.1734
130	.0861	.0992	.1112	.1224	.1329	.1430	.1526	.1618
140	.0804	.0926	.1039	.1144	.1244	.1338	.1429	.1516
150	.0753	.0869	.0975	.1074	.1168	.1258	.1344	.1427
200	.0573	.0662	.0745	.0823	.0896	.0967	.1035	.1101
300	.0388	.0449	.0506	.0560	.0612	.0661	.0709	.0756
400	.0293	.0340	.0383	.0425	.0464	.0502	.0539	.0575
500	.0235	.0273	.0309	.0342	.0374	.0405	.0435	.0464
600	.0197	.0228	.0258	.0286	.0313	.0339	.0365	.0389
700	.0169	.0196	.0222	.0246	.0269	.0292	.0314	.0335
800	.0148	.0172	.0195	.0216	.0236	.0256	.0275	.0294
900	.0132	.0153	.0173	.0192	.0211	.0228	.0245	.0262
1000	.0119	.0138	.0156	.0173	.0190	.0206	.0221	.0236

Upper percentage points of .950 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

n	m = 8	9	10	11	12	13	14	15
1	.9911	.9918	.9924	.9930	.9934	.9938	.9942	.9945
2	.9763	.9781	.9796	.9810	.9822	.9832	.9841	.9850
3	.9571	.9602	.9630	.9653	.9674	.9692	.9709	.9724
4	.9355	.9400	.9439	.9474	.9504	.9531	.9556	.9578
5	.9126	.9185	.9236	.9281	.9321	.9357	.9390	.9419
6	.8892	.8964	.9026	.9082	.9132	.9176	.9216	.9252
7	.8658	.8742	.8815	.8881	.8939	.8992	.9039	.9082
8	.8428	.8522	.8605	.8680	.8746	.8806	.8861	.8911
9	.8203	.8307	.8399	.8481	.8555	.8623	.8684	.8740
10	.7985	.8097	.8197	.8287	.8368	.8442	.8509	.8571
11	.7774	.7893	.8000	.8097	.8184	.8264	.8337	.8404
12	.7570	.7697	.7810	.7913	.8006	.8091	.8169	.8240
13	.7375	.7507	.7626	.7734	.7832	.7922	.8005	.8081
14	.7187	.7324	.7448	.7561	.7664	.7758	.7845	.7925
15	.7007	.7149	.7277	.7394	.7501	.7599	.7689	.7773
16	.6835	.6980	.7112	.7232	.7343	.7444	.7538	.7626
17	.6670	.6818	.6953	.7077	.7190	.7295	.7392	.7482
18	.6511	.6662	.6800	.6926	.7043	.7150	.7250	.7343
19	.6359	.6512	.6653	.6782	.6901	.7011	.7113	.7208
20	.6213	.6369	.6511	.6642	.6763	.6875	.6980	.7077
22	.5940	.6098	.6243	.6377	.6502	.6618	.6726	.6827
24	.5687	.5847	.5995	.6131	.6258	.6377	.6488	.6592
26	.5454	.5615	.5764	.5902	.6031	.6152	.6265	.6371
28	.5239	.5399	.5549	.5688	.5818	.5940	.6055	.6163
30	.5039	.5199	.5349	.5488	.5619	.5742	.5858	.5967
35	.4598	.4756	.4904	.5043	.5174	.5297	.5414	.5525
40	.4226	.4380	.4525	.4662	.4791	.4914	.5030	.5141
45	.3909	.4058	.4200	.4333	.4460	.4581	.4696	.4805
50	.3635	.3780	.3917	.4047	.4171	.4289	.4402	.4510
55	.3397	.3536	.3669	.3795	.3916	.4031	.4142	.4247
60	.3187	.3322	.3450	.3573	.3690	.3802	.3910	.4013
65	.3002	.3132	.3256	.3375	.3488	.3598	.3702	.3803
70	.2837	.2962	.3082	.3197	.3307	.3414	.3516	.3614
75	.2689	.2810	.2926	.3037	.3144	.3247	.3347	.3442
80	.2556	.2673	.2785	.2892	.2996	.3096	.3193	.3286
90	.2325	.2434	.2539	.2640	.2738	.2832	.2924	.3012
100	.2132	.2234	.2333	.2428	.2521	.2610	.2696	.2780
110	.1969	.2065	.2158	.2248	.2335	.2420	.2502	.2581
120	.1829	.1919	.2007	.2092	.2175	.2255	.2333	.2409
130	.1707	.1793	.1876	.1957	.2035	.2111	.2186	.2258
140	.1601	.1682	.1761	.1838	.1912	.1985	.2056	.2125
150	.1507	.1584	.1659	.1732	.1803	.1873	.1940	.2006
200	.1165	.1227	.1287	.1346	.1403	.1460	.1515	.1569
300	.0801	.0845	.0888	.0930	.0972	.1013	.1053	.1092
400	.0610	.0644	.0678	.0711	.0743	.0775	.0806	.0837
500	.0493	.0521	.0548	.0575	.0602	.0628	.0654	.0679
600	.0413	.0437	.0460	.0483	.0505	.0528	.0549	.0571
700	.0356	.0376	.0397	.0416	.0436	.0455	.0474	.0493
800	.0313	.0331	.0348	.0366	.0383	.0400	.0417	.0433
900	.0279	.0295	.0311	.0326	.0342	.0357	.0372	.0387
1000	.0251	.0266	.0280	.0294	.0308	.0322	.0336	.0349

Upper percentage points of .975 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

n	m = 0	1	2	3	4	5	6	7
1	.9799	.9844	.9873	.9892	.9907	.9918	.9926	.9933
2	.9454	.9565	.9638	.9690	.9728	.9758	.9783	.9802
3	.9036	.9214	.9336	.9424	.9492	.9545	.9588	.9624
4	.8599	.8837	.9004	.9128	.9224	.9301	.9364	.9416
5	.8170	.8457	.8663	.8819	.8942	.9041	.9123	.9192
6	.7762	.8088	.8327	.8511	.8658	.8777	.8877	.8961
7	.7380	.7736	.8002	.8210	.8377	.8514	.8630	.8729
8	.7025	.7404	.7692	.7919	.8104	.8257	.8387	.8498
9	.6696	.7093	.7398	.7641	.7840	.8007	.8149	.8272
10	.6393	.6802	.7120	.7376	.7588	.7767	.7920	.8052
11	.6113	.6531	.6859	.7125	.7347	.7535	.7698	.7839
12	.5855	.6278	.6613	.6888	.7118	.7314	.7485	.7634
13	.5615	.6042	.6382	.6663	.6900	.7103	.7280	.7436
14	.5394	.5821	.6165	.6451	.6693	.6902	.7085	.7246
15	.5188	.5615	.5961	.6250	.6496	.6710	.6897	.7063
16	.4996	.5422	.5769	.6060	.6310	.6527	.6718	.6888
17	.4818	.5241	.5588	.5880	.6132	.6353	.6547	.6720
18	.4651	.5071	.5417	.5710	.5964	.6186	.6383	.6559
19	.4495	.4911	.5256	.5549	.5804	.6028	.6227	.6405
20	.4349	.4761	.5103	.5396	.5651	.5876	.6077	.6257
22	.4083	.4485	.4823	.5113	.5368	.5594	.5796	.5979
24	.3847	.4239	.4570	.4857	.5110	.5336	.5539	.5723
26	.3636	.4017	.4342	.4625	.4875	.5099	.5302	.5487
28	.3447	.3818	.4135	.4413	.4660	.4882	.5084	.5268
30	.3276	.3636	.3946	.4219	.4462	.4682	.4882	.5065
35	.2914	.3250	.3541	.3800	.4033	.4245	.4439	.4619
40	.2624	.2936	.3210	.3455	.3677	.3880	.4068	.4242
45	.2386	.2678	.2935	.3167	.3378	.3573	.3753	.3921
50	.2187	.2461	.2704	.2923	.3124	.3310	.3483	.3645
55	.2019	.2276	.2506	.2714	.2905	.3083	.3249	.3404
60	.1874	.2117	.2334	.2532	.2714	.2884	.3043	.3193
65	.1749	.1979	.2185	.2373	.2547	.2710	.2862	.3007
70	.1640	.1858	.2053	.2233	.2399	.2555	.2702	.2840
75	.1543	.1750	.1937	.2108	.2267	.2417	.2558	.2691
80	.1457	.1655	.1833	.1997	.2149	.2293	.2428	.2557
90	.1311	.1491	.1655	.1805	.1946	.2079	.2205	.2325
100	.1192	.1357	.1508	.1648	.1778	.1902	.2019	.2131
110	.1092	.1246	.1385	.1515	.1637	.1752	.1862	.1967
120	.1008	.1151	.1281	.1402	.1516	.1625	.1728	.1827
130	.0936	.1069	.1191	.1305	.1412	.1514	.1612	.1705
140	.0873	.0999	.1113	.1221	.1322	.1418	.1510	.1598
150	.0819	.0937	.1045	.1146	.1242	.1333	.1420	.1504
200	.0624	.0715	.0799	.0879	.0954	.1026	.1095	.1162
300	.0422	.0485	.0544	.0599	.0652	.0702	.0751	.0798
400	.0319	.0367	.0412	.0454	.0495	.0534	.0571	.0608
500	.0257	.0295	.0332	.0366	.0399	.0430	.0461	.0491
600	.0214	.0247	.0278	.0306	.0334	.0361	.0387	.0412
700	.0184	.0212	.0239	.0263	.0287	.0310	.0333	.0355
800	.0162	.0186	.0209	.0231	.0252	.0272	.0292	.0311
900	.0144	.0166	.0186	.0206	.0225	.0243	.0260	.0277
1000	.0130	.0149	.0168	.0186	.0202	.0219	.0235	.0250

Upper percentage points of .975 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

	m							
n	8	9	10	11	12	13	14	15
1	.9939	.9944	.9948	.9952	.9955	.9958	.9960	.9962
2	.9819	.9833	.9844	.9855	.9864	.9872	.9879	.9885
3	.9653	.9679	.9701	.9720	.9737	.9752	.9765	.9777
4	.9460	.9498	.9531	.9560	.9586	.9609	.9629	.9647
5	.9251	.9302	.9346	.9385	.9420	.9450	.9478	.9503
6	.9034	.9097	.9152	.9201	.9244	.9283	.9318	.9350
7	.8814	.8888	.8954	.9012	.9064	.9110	.9153	.9191
8	.8595	.8680	.8755	.8822	.8882	.8936	.8985	.9029
9	.8379	.8474	.8557	.8632	.8700	.8761	.8816	.8867
10	.8169	.8272	.8363	.8446	.8520	.8587	.8649	.8705
11	.7964	.8074	.8173	.8262	.8343	.8416	.8483	.8545
12	.7765	.7883	.7988	.8083	.8170	.8248	.8320	.8387
13	.7574	.7697	.7808	.7909	.8000	.8084	.8161	.8232
14	.7389	.7518	.7634	.7740	.7836	.7924	.8005	.8080
15	.7211	.7345	.7466	.7575	.7676	.7768	.7853	.7932
16	.7041	.7178	.7303	.7416	.7521	.7616	.7705	.7787
17	.6876	.7017	.7145	.7262	.7370	.7469	.7561	.7646
18	.6718	.6862	.6993	.7114	.7224	.7326	.7421	.7509
19	.6566	.6713	.6847	.6970	.7083	.7188	.7285	.7376
20	.6421	.6569	.6706	.6831	.6946	.7054	.7153	.7246
22	.6146	.6298	.6438	.6567	.6686	.6797	.6901	.6998
24	.5891	.6046	.6188	.6320	.6443	.6557	.6664	.6764
26	.5656	.5812	.5956	.6090	.6215	.6331	.6440	.6543
28	.5438	.5594	.5739	.5875	.6001	.6119	.6230	.6335
30	.5234	.5391	.5537	.5673	.5800	.5920	.6032	.6138
35	.4785	.4940	.5085	.5222	.5350	.5470	.5585	.5693
40	.4405	.4557	.4700	.4834	.4961	.5082	.5196	.5304
45	.4079	.4227	.4366	.4499	.4624	.4743	.4856	.4964
50	.3797	.3941	.4077	.4205	.4328	.4445	.4556	.4663
55	.3551	.3690	.3822	.3947	.4067	.4181	.4291	.4395
60	.3335	.3469	.3597	.3719	.3835	.3947	.4054	.4156
65	.3143	.3273	.3397	.3515	.3628	.3737	.3841	.3941
70	.2972	.3097	.3217	.3332	.3442	.3548	.3649	.3747
75	.2818	.2940	.3056	.3167	.3274	.3376	.3476	.3571
80	.2680	.2797	.2909	.3017	.3121	.3221	.3317	.3411
90	.2440	.2549	.2655	.2756	.2854	.2949	.3040	.3129
100	.2239	.2342	.2441	.2537	.2629	.2719	.2806	.2890
110	.2068	.2165	.2259	.2350	.2437	.2522	.2604	.2685
120	.1922	.2014	.2102	.2188	.2271	.2352	.2430	.2506
130	.1795	.1882	.1966	.2047	.2126	.2203	.2277	.2350
140	.1684	.1766	.1846	.1923	.1998	.2071	.2143	.2212
150	.1585	.1664	.1739	.1813	.1885	.1955	.2023	.2090
200	.1227	.1290	.1351	.1410	.1469	.1525	.1581	.1636
300	.0844	.0889	.0933	.0976	.1018	.1060	.1100	.1140
400	.0644	.0679	.0713	.0746	.0779	.0812	.0843	.0875
500	.0520	.0549	.0577	.0604	.0631	.0658	.0684	.0710
600	.0436	.0460	.0484	.0507	.0530	.0553	.0575	.0597
700	.0376	.0397	.0417	.0437	.0457	.0477	.0496	.0515
800	.0330	.0348	.0367	.0384	.0402	.0419	.0436	.0453
900	.0294	.0311	.0327	.0343	.0358	.0374	.0389	.0404
1000	.0265	.0280	.0295	.0309	.0324	.0338	.0351	.0365

Upper percentage points of .985 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

	m							
n	0	1	2	3	4	5	6	7
1	.9847	.9881	.9903	.9918	.9929	.9937	.9944	.9949
2	.9548	.9640	.9700	.9743	.9776	.9800	.9820	.9837
3	.9168	.9323	.9428	.9504	.9563	.9608	.9646	.9676
4	.8759	.8971	.9119	.9230	.9315	.9383	.9439	.9485
5	.8350	.8611	.8798	.8939	.9050	.9139	.9213	.9275
6	.7956	.8256	.8476	.8645	.8779	.8888	.8979	.9056
7	.7583	.7915	.8162	.8354	.8509	.8636	.8743	.8834
8	.7233	.7590	.7859	.8071	.8244	.8387	.8508	.8611
9	.6908	.7283	.7571	.7799	.7987	.8144	.8277	.8392
10	.6606	.6995	.7297	.7539	.7740	.7908	.8053	.8178
11	.6326	.6725	.7038	.7292	.7502	.7681	.7835	.7969
12	.6066	.6473	.6794	.7056	.7276	.7463	.7625	.7767
13	.5825	.6236	.6563	.6833	.7060	.7254	.7424	.7572
14	.5601	.6014	.6346	.6621	.6854	.7055	.7230	.7384
15	.5392	.5806	.6141	.6420	.6658	.6864	.7044	.7203
16	.5197	.5611	.5948	.6230	.6471	.6681	.6866	.7029
17	.5015	.5428	.5765	.6050	.6294	.6507	.6695	.6862
18	.4845	.5256	.5593	.5878	.6125	.6340	.6531	.6702
19	.4686	.5093	.5430	.5716	.5964	.6181	.6375	.6548
20	.4536	.4940	.5275	.5562	.5810	.6029	.6225	.6400
22	.4263	.4659	.4990	.5275	.5524	.5745	.5943	.6121
24	.4021	.4407	.4733	.5015	.5264	.5485	.5683	.5864
26	.3803	.4180	.4501	.4779	.5025	.5245	.5444	.5626
28	.3608	.3975	.4289	.4563	.4807	.5025	.5224	.5405
30	.3431	.3789	.4096	.4365	.4606	.4822	.5019	.5200
35	.3056	.3391	.3680	.3937	.4168	.4378	.4570	.4747
40	.2755	.3067	.3340	.3584	.3804	.4006	.4192	.4365
45	.2507	.2799	.3057	.3288	.3498	.3692	.3871	.4038
50	.2300	.2574	.2817	.3037	.3237	.3423	.3595	.3756
55	.2124	.2383	.2612	.2821	.3012	.3189	.3355	.3510
60	.1973	.2217	.2435	.2633	.2816	.2986	.3145	.3294
65	.1842	.2073	.2280	.2469	.2644	.2806	.2959	.3103
70	.1727	.1947	.2144	.2324	.2491	.2647	.2794	.2933
75	.1626	.1835	.2023	.2195	.2355	.2505	.2646	.2780
80	.1536	.1735	.1914	.2079	.2233	.2377	.2513	.2642
90	.1383	.1565	.1729	.1881	.2023	.2157	.2283	.2404
100	.1257	.1425	.1577	.1718	.1849	.1974	.2092	.2204
110	.1153	.1308	.1449	.1580	.1703	.1819	.1930	.2036
120	.1064	.1209	.1340	.1463	.1578	.1687	.1791	.1891
130	.0988	.1123	.1247	.1362	.1470	.1573	.1671	.1765
140	.0922	.1049	.1165	.1274	.1376	.1473	.1566	.1655
150	.0865	.0984	.1094	.1196	.1293	.1385	.1473	.1558
200	.0659	.0752	.0837	.0918	.0994	.1067	.1137	.1204
300	.0446	.0511	.0570	.0626	.0679	.0731	.0780	.0828
400	.0338	.0387	.0432	.0475	.0516	.0556	.0594	.0631
500	.0271	.0311	.0348	.0383	.0416	.0448	.0479	.0510
600	.0227	.0260	.0291	.0320	.0348	.0376	.0402	.0427
700	.0195	.0224	.0250	.0276	.0300	.0323	.0346	.0368
800	.0171	.0196	.0220	.0242	.0263	.0284	.0304	.0323
900	.0152	.0175	.0195	.0215	.0234	.0253	.0271	.0288
1000	.0137	.0157	.0176	.0194	.0211	.0228	.0244	.0260

Upper percentage points of .985 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

n	m = 8	9	10	11	12	13	14	15
1	.9954	.9957	.9961	.9963	.9966	.9968	.9970	.9971
2	.9850	.9862	.9872	.9880	.9888	.9894	.9900	.9905
3	.9702	.9724	.9743	.9759	.9774	.9787	.9798	.9808
4	.9524	.9558	.9587	.9613	.9635	.9655	.9673	.9689
5	.9328	.9374	.9414	.9449	.9480	.9508	.9532	.9555
6	.9123	.9180	.9230	.9275	.9314	.9350	.9381	.9410
7	.8912	.8981	.9041	.9094	.9142	.9185	.9224	.9259
8	.8701	.8780	.8850	.8912	.8967	.9018	.9063	.9104
9	.8492	.8581	.8659	.8729	.8792	.8849	.8901	.8948
10	.8287	.8384	.8470	.8548	.8617	.8681	.8738	.8791
11	.8087	.8192	.8285	.8369	.8445	.8514	.8577	.8635
12	.7892	.8004	.8104	.8194	.8276	.8350	.8419	.8481
13	.7704	.7821	.7927	.8023	.8110	.8190	.8263	.8330
14	.7522	.7645	.7756	.7856	.7948	.8032	.8110	.8181
15	.7346	.7474	.7589	.7694	.7791	.7879	.7960	.8035
16	.7176	.7308	.7428	.7537	.7637	.7729	.7814	.7893
17	.7013	.7149	.7272	.7385	.7488	.7584	.7672	.7754
18	.6855	.6995	.7121	.7237	.7344	.7442	.7534	.7618
19	.6704	.6846	.6976	.7094	.7204	.7305	.7399	.7486
20	.6558	.6703	.6835	.6956	.7068	.7172	.7268	.7358
22	.6283	.6431	.6567	.6693	.6809	.6917	.7017	.7111
24	.6028	.6179	.6318	.6446	.6566	.6677	.6781	.6878
26	.5791	.5944	.6085	.6216	.6337	.6451	.6557	.6657
28	.5571	.5725	.5867	.5999	.6123	.6239	.6347	.6449
30	.5366	.5520	.5663	.5797	.5921	.6038	.6149	.6252
35	.4912	.5065	.5208	.5342	.5468	.5587	.5699	.5805
40	.4526	.4676	.4817	.4950	.5076	.5195	.5307	.5414
45	.4195	.4341	.4480	.4611	.4734	.4852	.4964	.5071
50	.3908	.4050	.4185	.4313	.4435	.4550	.4661	.4766
55	.3657	.3795	.3926	.4051	.4170	.4283	.4392	.4496
60	.3436	.3570	.3697	.3818	.3934	.4045	.4151	.4253
65	.3240	.3369	.3493	.3611	.3723	.3831	.3935	.4035
70	.3064	.3190	.3309	.3424	.3534	.3639	.3740	.3838
75	.2907	.3028	.3144	.3255	.3362	.3465	.3564	.3659
80	.2765	.2882	.2995	.3103	.3206	.3306	.3402	.3495
90	.2518	.2629	.2734	.2836	.2934	.3029	.3120	.3209
100	.2312	.2416	.2515	.2611	.2704	.2794	.2881	.2965
110	.2137	.2234	.2329	.2419	.2507	.2592	.2675	.2755
120	.1986	.2079	.2168	.2254	.2337	.2418	.2497	.2573
130	.1856	.1943	.2027	.2109	.2188	.2265	.2340	.2413
140	.1741	.1824	.1904	.1982	.2057	.2131	.2203	.2272
150	.1639	.1718	.1795	.1869	.1941	.2012	.2080	.2147
200	.1270	.1333	.1395	.1455	.1514	.1571	.1627	.1682
300	.0875	.0920	.0964	.1008	.1050	.1092	.1133	.1173
400	.0667	.0702	.0737	.0771	.0804	.0837	.0869	.0901
500	.0539	.0568	.0596	.0624	.0651	.0678	.0705	.0731
600	.0452	.0477	.0501	.0524	.0547	.0570	.0593	.0615
700	.0390	.0411	.0432	.0452	.0472	.0492	.0511	.0531
800	.0342	.0361	.0379	.0397	.0415	.0432	.0450	.0467
900	.0305	.0322	.0338	.0354	.0370	.0386	.0401	.0416
1000	.0275	.0290	.0305	.0320	.0334	.0348	.0362	.0376

Upper percentage points of .990 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0,when s=5

	m							
n	0	1	2	3	4	5	6	7
1	.9876	.9904	.9921	.9934	.9942	.9949	.9955	.9959
2	.9610	.9689	.9742	.9779	.9807	.9828	.9845	.9859
3	.9258	.9396	.9490	.9559	.9611	.9652	.9685	.9712
4	.8871	.9064	.9200	.9300	.9378	.9440	.9491	.9533
5	.8478	.8719	.8892	.9023	.9126	.9208	.9276	.9334
6	.8094	.8376	.8582	.8739	.8865	.8967	.9052	.9124
7	.7729	.8043	.8276	.8457	.8603	.8723	.8823	.8909
8	.7385	.7724	.7980	.8181	.8345	.8480	.8595	.8693
9	.7062	.7422	.7696	.7914	.8093	.8242	.8369	.8479
10	.6762	.7136	.7426	.7658	.7850	.8011	.8149	.8269
11	.6482	.6868	.7169	.7413	.7616	.7788	.7935	.8064
12	.6222	.6616	.6926	.7180	.7392	.7572	.7728	.7865
13	.5980	.6379	.6696	.6957	.7177	.7365	.7529	.7672
14	.5754	.6157	.6479	.6746	.6972	.7167	.7336	.7486
15	.5544	.5948	.6274	.6546	.6777	.6977	.7152	.7306
16	.5347	.5752	.6081	.6356	.6591	.6795	.6974	.7133
17	.5163	.5567	.5897	.6175	.6413	.6621	.6804	.6967
18	.4991	.5393	.5724	.6003	.6244	.6455	.6641	.6807
19	.4829	.5229	.5560	.5840	.6082	.6295	.6484	.6653
20	.4677	.5074	.5404	.5685	.5928	.6143	.6334	.6505
22	.4399	.4790	.5116	.5396	.5641	.5858	.6052	.6226
24	.4152	.4534	.4856	.5134	.5378	.5596	.5791	.5968
26	.3930	.4303	.4620	.4895	.5138	.5355	.5551	.5729
28	.3730	.4094	.4405	.4676	.4917	.5133	.5329	.5507
30	.3549	.3904	.4209	.4476	.4713	.4928	.5122	.5301
35	.3165	.3497	.3785	.4040	.4270	.4478	.4668	.4844
40	.2854	.3166	.3438	.3681	.3900	.4101	.4286	.4457
45	.2599	.2892	.3149	.3379	.3589	.3782	.3960	.4126
50	.2386	.2661	.2904	.3123	.3323	.3508	.3680	.3840
55	.2204	.2464	.2694	.2902	.3093	.3270	.3436	.3590
60	.2048	.2293	.2512	.2710	.2893	.3063	.3222	.3371
65	.1913	.2145	.2353	.2542	.2717	.2880	.3032	.3176
70	.1795	.2015	.2213	.2393	.2561	.2717	.2864	.3003
75	.1690	.1900	.2088	.2261	.2422	.2572	.2713	.2847
80	.1597	.1797	.1977	.2143	.2297	.2441	.2577	.2707
90	.1438	.1621	.1786	.1939	.2082	.2216	.2343	.2463
100	.1308	.1476	.1629	.1771	.1903	.2028	.2147	.2260
110	.1199	.1355	.1498	.1630	.1753	.1870	.1981	.2087
120	.1107	.1253	.1386	.1509	.1625	.1735	.1839	.1939
130	.1028	.1165	.1289	.1405	.1514	.1617	.1716	.1811
140	.0960	.1088	.1205	.1314	.1417	.1515	.1608	.1698
150	.0900	.1021	.1132	.1235	.1332	.1425	.1514	.1599
200	.0686	.0780	.0867	.0948	.1024	.1098	.1168	.1236
300	.0465	.0530	.0590	.0647	.0701	.0752	.0802	.0851
400	.0352	.0401	.0447	.0491	.0532	.0572	.0611	.0648
500	.0283	.0323	.0360	.0396	.0429	.0462	.0493	.0524
600	.0237	.0270	.0302	.0331	.0360	.0387	.0414	.0439
700	.0203	.0232	.0259	.0285	.0309	.0333	.0356	.0378
800	.0178	.0204	.0227	.0250	.0272	.0292	.0313	.0332
900	.0159	.0181	.0203	.0223	.0242	.0260	.0279	.0296
1000	.0143	.0163	.0183	.0201	.0218	.0235	.0251	.0267

Upper percentage points of .990 of theta(p,m,n)
,the largest eigenvalue of |B-theta(W+B)|=0, when s=5

n	m = 8	9	10	11	12	13	14	15
1	.9963	.9966	.9968	.9970	.9972	.9974	.9975	.9977
2	.9871	.9881	.9889	.9897	.9903	.9909	.9914	.9919
3	.9735	.9755	.9771	.9786	.9799	.9810	.9821	.9830
4	.9568	.9599	.9626	.9649	.9669	.9687	.9704	.9718
5	.9383	.9425	.9461	.9494	.9522	.9548	.9571	.9591
6	.9185	.9239	.9285	.9327	.9364	.9397	.9426	.9453
7	.8982	.9047	.9103	.9153	.9198	.9238	.9275	.9308
8	.8778	.8852	.8918	.8976	.9029	.9076	.9119	.9158
9	.8574	.8658	.8732	.8799	.8858	.8912	.8961	.9006
10	.8373	.8466	.8548	.8622	.8688	.8748	.8803	.8853
11	.8177	.8277	.8366	.8447	.8519	.8585	.8646	.8701
12	.7985	.8092	.8188	.8275	.8353	.8425	.8490	.8550
13	.7799	.7912	.8014	.8106	.8190	.8266	.8337	.8401
14	.7618	.7737	.7845	.7942	.8030	.8111	.8186	.8255
15	.7444	.7568	.7680	.7782	.7875	.7960	.8038	.8111
16	.7276	.7404	.7520	.7626	.7723	.7812	.7894	.7970
17	.7113	.7245	.7365	.7475	.7575	.7668	.7753	.7833
18	.6957	.7092	.7216	.7328	.7432	.7528	.7616	.7699
19	.6806	.6944	.7070	.7186	.7293	.7391	.7483	.7568
20	.6660	.6801	.6930	.7049	.7158	.7259	.7353	.7440
22	.6385	.6530	.6663	.6786	.6899	.7005	.7103	.7195
24	.6130	.6278	.6414	.6540	.6657	.6766	.6867	.6962
26	.5892	.6042	.6181	.6309	.6428	.6540	.6644	.6742
28	.5671	.5822	.5962	.6092	.6214	.6327	.6434	.6534
30	.5465	.5617	.5758	.5889	.6012	.6127	.6235	.6337
35	.5007	.5158	.5299	.5432	.5556	.5674	.5785	.5889
40	.4617	.4766	.4906	.5038	.5162	.5279	.5391	.5497
45	.4282	.4427	.4565	.4695	.4818	.4934	.5045	.5151
50	.3991	.4133	.4267	.4394	.4515	.4630	.4739	.4844
55	.3736	.3874	.4005	.4129	.4247	.4360	.4468	.4571
60	.3512	.3645	.3772	.3893	.4009	.4119	.4225	.4326
65	.3313	.3442	.3565	.3683	.3795	.3903	.4006	.4106
70	.3134	.3260	.3379	.3493	.3603	.3708	.3809	.3906
75	.2974	.3095	.3211	.3322	.3429	.3531	.3630	.3725
80	.2830	.2947	.3059	.3167	.3271	.3371	.3467	.3560
90	.2578	.2689	.2794	.2896	.2994	.3089	.3180	.3269
100	.2368	.2472	.2571	.2668	.2760	.2850	.2937	.3021
110	.2189	.2287	.2381	.2472	.2560	.2646	.2728	.2809
120	.2035	.2128	.2217	.2303	.2387	.2468	.2547	.2624
130	.1902	.1989	.2074	.2156	.2236	.2313	.2388	.2461
140	.1784	.1868	.1948	.2026	.2102	.2176	.2248	.2318
150	.1681	.1760	.1837	.1912	.1984	.2055	.2123	.2190
200	.1302	.1366	.1428	.1489	.1548	.1605	.1662	.1717
300	.0898	.0943	.0988	.1032	.1075	.1117	.1158	.1198
400	.0685	.0721	.0755	.0790	.0823	.0856	.0888	.0920
500	.0554	.0583	.0611	.0639	.0667	.0694	.0721	.0747
600	.0465	.0489	.0513	.0537	.0560	.0583	.0606	.0628
700	.0400	.0422	.0443	.0463	.0483	.0503	.0523	.0542
800	.0351	.0370	.0389	.0407	.0425	.0443	.0460	.0477
900	.0313	.0330	.0347	.0363	.0379	.0395	.0410	.0426
1000	.0283	.0298	.0313	.0328	.0342	.0356	.0371	.0385