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Totally positive algebraic integers of small trace

TOTALLY POSITIVE ALGEBRAIC INTEGERS
OF SMALL TRACE

by Christopher SMYTH

Let $r \geqslant 0$ be a given integer. We describe an algorithm for finding all totally positive algebraic integers α which satisfy

$$\mathrm{Tr}\ \alpha - \deg \alpha = r \tag{1}$$

(where $\mathrm{Tr}\ \alpha =$ trace of α, $\deg \alpha =$ degree of α). That r must be non-negative is an immediate consequence of the inequality of the arithmetic and geometric means. The algorithm is based on a recent improvement [5] of a result of Siegel [3], combined with a method of Robinson [1] for enumerating totally real polynomials of a specific type. The algorithm was implemented on the University College, Cardiff, Honeywell computer which took 40 minutes CPU time to find all relevant α with $r = 0, 1, 2, \ldots, 6$. (Almost all of this time was spent on the last case: $r = 6$, $\deg \alpha = 7$). The table of these α appears as an appendix to this paper.

This work was stimulated by a question of Serre, who asked for a list of these algebraic integers, for an application connected with bounding the number of points on algebraic curves over finite fields.

1. Bounding the degree.

Assume from now on that α is a totally positive algebraic integer of degree d. Siegel showed that then $\mathrm{Tr}\ \alpha > \dfrac{3}{2} d$ unless $\alpha = 1$ or $(3 \pm \sqrt{5})/2$. His method was to use known lower

bounds for the discriminant $\prod_{i \neq j} (\alpha_i - \alpha_j)$ (the α_i being the conjugates of α) to improve upon the inequality of the arithmetic and geometric means. From Siegel's result we see on using (1) that $d < 2r \, (\alpha \neq 1, (3 \pm \sqrt{5})/2)$. This bounds d for fixed r. However, the bound is not a sharp one, as e.g. for $r = 6$ we get $d \leqslant 11$ while in fact, as we shall see below, $d \leqslant 7$.

My recent improvement of Siegel's result is contained in the following theorem, and produces a corresponding improvement in the bounds for the degree, which are sharp at least for $r \leqslant 6$.

THEOREM. $-$ *If α is a totally positive algebraic integer satisfying (1), then*

$$\operatorname{Tr} \alpha > 1.7719 \, d \qquad (2)$$

and

$$d \leqslant [1.2955 \, r] = : \mathrm{B}(r) \qquad (3)$$

unless α has minimal polynomial

$$x - 1, x^2 - 3x + 1, x^3 - 5x^2 + 6x - 1, x^4 - 7x^3 + 13x^2 - 7x + 1$$

or $x^4 - 7x^3 + 14x^2 - 8x + 1$.

The results of [5] are in fact stated for totally real rather than totally positive algebraic integers, but are easily modified. The result we need here is that since $\alpha = (\sqrt{\alpha})^2$ and $\sqrt{\alpha}$ is totally real, from [5, Table 1, $p = 2$] we have,

$$\operatorname{Tr} \alpha > (1.33114)^2 \, d > 1.7719 \, d \,,$$

with the five exceptions above. Then (3) follows immediately.

r	1	2	3	4	5	6	7 ...
B(r)	1	2	3	5	6	7	9 ...

The method used in [5] to bound the trace differs from Siegel's method in that *resultant* information is used instead of discriminant information, to improve the lower bound for $\operatorname{Tr} \alpha$. Here is an outline of the method:

We make a list of totally positive algebraic integers α', with minimal polynomials $P_1, P_2, \ldots, P_n$ say, which have

(trace α')/deg α' small. Then for any totally positive α not on the list, the resultant of α and α' is non-zero, and so at least 1 in absolute value. Hence, writing

$$\mu_\alpha(x) = d^{-1} \times \text{(number of conjugates of } \alpha \text{ in } (0,x))$$

we have

$$\int_0^\infty \log|P_j(x)| \, d\mu_\alpha(x) \geqslant 0 \quad (j = 1, \ldots, n).$$

Also $d^{-1} \operatorname{Tr} \alpha = \int_0^\infty x \, d\mu_\alpha(x)$.

Hence if we can solve $\min\limits_{\mu} \int_0^\infty x \, d\mu_\alpha(x)$ subject to

$$\int_0^\infty \log|P_j(x)| \, d\mu_\alpha(x) \geqslant 0 \quad (j = 1, \ldots, n)$$

the minimum being taken over *all* probability distributions μ on $(0, \infty)$, we will have obtained a lower bound for $d^{-1} \operatorname{Tr} \alpha$. This latter problem is conveniently attacked by first forming the dual problem, which is

$$\underset{c_1, c_2, \ldots, c_n \geqslant 0}{\text{Maximize}} \quad \underset{x > 0}{\text{Min}} \left(x - \sum_{j=1}^n c_j \log|P_j(x)| \right).$$

This can be efficiently solved by an iterative method (essentially as described in [4]) similar to the Remes Algorithm of approximation theory (see [1]).

2. Enumeration of the polynomials.

To apply the enumeration algorithm, we fix not only r but also $d \leqslant B(r)$. Since the problem is trivial for $r = 0$ or 1, we assume $r \geqslant 2$. Robinson's method, which he used to search for polynomials of span less than 4, is to use the fact that if a polynomial has all real roots, so do all its derivatives. His basic result can be stated as a

LEMMA. $-$ *Let* $k \geqslant 2$, *and* $p(x)$ *be a monic polynomial of degree* $k - 1$, *with real zeros* $\beta_1 > \beta_2 > \beta_3 \ldots > \beta_{k-1} > 0$. *Let* $P(x) = k \int_0^x p(t) \, dt$, *monic of degree* k. *Then* $P(x) - c$ *has all zeros real and positive iff* $(-1)^k c < 0$ *and*

$$\max_{i=1}^{[k/2]} P(\beta_{2i-1}) \leqslant c \leqslant \min_{i=1}^{[(k-1)/2]} P(\beta_{2i}).$$

Proof. – Obvious from the graph of $P(x)$.

This lemma is applied to generate a finite tree search, to enumerate the required polynomials, in the following way. Put

$$P_\alpha(x) := x^d - (r + d) x^{d-1} + a_2 x^{d-2} - \ldots + (-1)^d a_d,$$

the minimal polynomial of α. Then for $k = d, d-1, \ldots, 1$ write

$$P_{\alpha,k}(x) := \frac{k! \; d^{d-k}}{d! \; dx^{d-k}} P_\alpha(x)$$

$$= x^k - (r + d) \frac{k}{d} x^{k-1} + \ldots + (-1)^k a_k / \binom{d}{k}. \quad (4)$$

In particular $P_{\alpha,2}(x) = x^2 - (r + d) \frac{2}{d} x + a_2 / \binom{d}{2}$. If $P_\alpha = P_{\alpha,d}$ has all zeros real, so have $P_{\alpha,d-1}, P_{\alpha,d-2}, \ldots, P_{\alpha,2}$. Hence the lemma can be applied successively to $P_{\alpha,1}, P_{\alpha,2}, \ldots, P_{\alpha,d-1}$ to find ranges for $a_2, a_3, \ldots, a_d$ which ensure in turn that $P_{\alpha,2}, \ldots, P_{\alpha,d}$ have all zeros real and positive. This produces a tree whose root is $a_1 = r + d$ (the first generation), and whose k th generation consists of nodes a_k which have the property that the path $a_1, a_2, a_3, \ldots, a_k$ from the root to a_k corresponds to a polynomial $P_{\alpha,k}$ as in (4) with all zeros real and positive.

When the lemma is applied with $p = P_{\alpha,k-1}$ and $-c = (-1)^k a_k / \binom{d}{k}$, there may be no integers a_k in the allowable range, in which case a_{k-1} is a terminal node. Otherwise there will be a finite number of choices for a_k.

All paths $a_1, a_2, a_3, \ldots, a_d$ in the completed tree correspond to monic integral polynomials P_α with all zeros real and positive. Some of these polynomials may of course be reducible, and must be eliminated from the list. To do this, note that if P_α is reducible, it must be factorable as

$$(x^{d'} - (r' + d') x^{d'-1} + \ldots)(x^{d-d'} + ((r - r') + (d - d')) x^{d-d'-1} + \ldots)$$

where $1 \leqslant d' \leqslant [1/2 \, d], 0 \leqslant r' \leqslant r$. Hence if we compute the P_α successively for $(r, d) = (0, 1), (1, 1), (1, 2), (2, 1), (2, 2), \ldots$, then any reducible polynomial must have as a factor one of the earlier irreducible polynomials found. In this way reducible polynomials are readily eliminated from the list.

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List of all totally positive algebraic integers with (trace − degree) at most 6

tr-deg	deg	max.zero	poly. disc.	poly. coefficients			
0	1	1.0000	1	1	-1		
1	1	2.0000	1	1	-2		
1	2	2.6180	5	1	-3	1	
2	1	3.0000	1	1	-3		
2	2	3.7321	12	1	-4	1	
2	2	3.4142	8	1	-4	2	
2	3	3.2470	49	1	-5	6	-1
3	1	4.0000	1	1	-4		
3	2	4.7913	21	1	-5	1	
3	2	4.5616	17	1	-5	2	
3	2	4.3028	13	1	-5	3	
3	2	3.6180	5	1	-5	5	
3	3	5.0489	49	1	-6	5	-1
3	3	4.4909	257	1	-6	7	-1
3	3	4.1149	229	1	-6	8	-1
3	3	4.2143	148	1	-6	8	-2
3	3	3.5321	81	1	-6	9	-1
3	3	3.8794	81	1	-6	9	-3
3	4	4.3903	725	1	-7	13	-7	1
3	4	3.9563	1125	1	-7	14	-8	1
4	1	5.0000	1	1	-5		
4	2	5.8284	32	1	-6	1	
4	2	5.6458	28	1	-6	2	
4	2	5.4495	24	1	-6	3	
4	2	5.2361	20	1	-6	4	
4	2	4.7321	12	1	-6	6	
4	2	4.4142	8	1	-6	7	
4	3	6.0329	257	1	-7	6	-1
4	3	5.6044	697	1	-7	8	-1
4	3	5.3539	788	1	-7	9	-1
4	3	5.4027	469	1	-7	9	-2
4	3	5.0644	761	1	-7	10	-1
4	3	5.1249	568	1	-7	10	-2
4	3	5.1819	321	1	-7	10	-3
4	3	4.7093	592	1	-7	11	-1
4	3	4.8662	404	1	-7	11	-3
4	3	4.9354	229	1	-7	11	-4
4	3	4.1987	257	1	-7	12	-1
4	3	4.3429	316	1	-7	12	-2
4	3	4.4605	321	1	-7	12	-3
4	3	4.6511	169	1	-7	12	-5

tr-des	des	max.zero	poly. disc.	poly. coefficients			
4	3	4.1701	148	1 -7 13 -5			
4	3	3.8019	49	1 -7 14 -7			
4	4	5.7834	1125	1 -8 14 -7	1		
4	4	5.5519	4752	1 -8 15 -8	1		
4	4	5.2227	4352	1 -8 16 -8	1		
4	4	5.2905	8069	1 -8 16 -9	1		
4	4	4.8931	7537	1 -8 17 -9	1		
4	4	4.9831	10512	1 -8 17 -10	1		
4	4	4.2498	1957	1 -8 18 -9	1		
4	4	4.4458	6224	1 -8 18 -10	1		
4	4	4.5906	9909	1 -8 18 -11	1		
4	4	4.6855	4352	1 -8 18 -12	2		
4	4	4.8116	725	1 -8 18 -13	1		
4	4	3.9021	2000	1 -8 19 -12	1		
4	4	4.1439	2777	1 -8 19 -13	2		
4	4	4.3799	5744	1 -8 19 -14	1		
4	4	3.9319	2304	1 -8 20 -16	1		
4	4	3.8478	2048	1 -8 20 -16	2		
4	4	4.0615	1957	1 -8 20 -17	3		
4	5	4.6254	38569	1 -9 26 -29	11	-1	
4	5	4.0264	36497	1 -9 27 -31	12	-1	
4	5	4.2608	38569	1 -9 27 -32	13	-1	
4	5	3.6825	14641	1 -9 28 -35	15	-1	
5	1	6.0000	1	1 -6			
5	2	6.8541	45	1 -7 1			
5	2	6.7016	41	1 -7 2			
5	2	6.5414	37	1 -7 3			
5	2	6.3723	33	1 -7 4			
5	2	6.1926	29	1 -7 5			
5	2	5.7913	21	1 -7 7			
5	2	5.5616	17	1 -7 8			
5	2	5.3028	13	1 -7 9			
5	2	4.6180	5	1 -7 11			
5	3	7.1842	229	1 -8 6 -1			
5	3	7.0236	697	1 -8 7 -1			
5	3	6.8794	148	1 -8 8 -2			
5	3	6.6739	1489	1 -8 9 -1			
5	3	6.4808	1765	1 -8 10 -1			
5	3	6.5114	1076	1 -8 10 -2			
5	3	6.2714	1929	1 -8 11 -1			
5	3	6.3059	1384	1 -8 11 -2			
5	3	6.3395	785	1 -8 11 -3			
5	3	6.0410	1957	1 -8 12 -1			
5	3	6.0806	1556	1 -8 12 -2			
5	3	6.1190	1101	1 -8 12 -3			
5	3	6.1563	592	1 -8 12 -4			
5	3	5.7813	1825	1 -8 13 -1			
5	3	5.8737	1257	1 -8 13 -3			
5	3	5.9173	892	1 -8 13 -4			
5	3	5.9593	473	1 -8 13 -5			
5	3	5.4774	1509	1 -8 14 -1			
5	3	5.5366	1396	1 -8 14 -2			
5	3	5.5926	1229	1 -8 14 -3			
5	3	5.6964	733	1 -8 14 -5			
5	3	5.7448	404	1 -8 14 -6			

tr-des	des	max.zero	poly. disc.	poly. coefficients				
5	3	5.0938	985	1	-8	15	-1	
5	3	5.1774	1016	1	-8	15	-2	
5	3	5.2534	993	1	-8	15	-3	
5	3	5.3234	916	1	-8	15	-4	
5	3	5.3885	785	1	-8	15	-5	
5	3	5.5070	361	1	-8	15	-7	
5	3	4.4728	229	1	-8	16	-1	
5	3	4.6554	404	1	-8	16	-2	
5	3	4.9032	592	1	-8	16	-4	
5	3	5.0861	564	1	-8	16	-6	
5	3	5.1642	469	1	-8	16	-7	
5	3	4.3772	169	1	-8	17	-5	
5	3	4.6996	321	1	-8	17	-7	
5	3	4.8136	316	1	-8	17	-8	
5	3	4.9122	257	1	-8	17	-9	
5	3	4.4812	148	1	-8	18	-10	
5	3	4.2470	49	1	-8	19	-13	
5	4	6.8240	8069	1	-9	16	-8	1
5	4	6.6067	7537	1	-9	17	-8	1
5	4	6.6407	16317	1	-9	17	-9	1
5	4	6.3660	1957	1	-9	18	-8	1
5	4	6.4054	21964	1	-9	18	-9	1
5	4	6.4437	25717	1	-9	18	-10	1
5	4	6.4751	2777	1	-9	18	-11	2
5	4	6.1399	19773	1	-9	19	-9	1
5	4	6.1854	35537	1	-9	19	-10	1
5	4	6.2292	36677	1	-9	19	-11	1
5	4	6.2648	11324	1	-9	19	-12	2
5	4	5.8857	33709	1	-9	20	-10	1
5	4	5.9400	47032	1	-9	20	-11	1
5	4	5.9916	48069	1	-9	20	-12	1
5	4	5.9832	8468	1	-9	20	-12	2
5	4	6.0729	1957	1	-9	20	-14	3
5	4	5.4340	5125	1	-9	21	-9	1
5	4	5.5151	23377	1	-9	21	-10	1
5	4	5.5891	40765	1	-9	21	-11	1
5	4	5.6575	53401	1	-9	21	-12	1
5	4	5.7213	56749	1	-9	21	-13	1
5	4	5.7105	19796	1	-9	21	-13	2
5	4	5.7711	30056	1	-9	21	-14	2
5	4	5.8379	14197	1	-9	21	-15	1
5	4	5.8188	9909	1	-9	21	-15	3
5	4	4.9705	8069	1	-9	22	-10	1
5	4	5.1052	20900	1	-9	22	-11	1
5	4	5.2166	35829	1	-9	22	-12	1
5	4	5.3132	49292	1	-9	22	-13	1
5	4	5.2959	10273	1	-9	22	-13	2
5	4	5.3992	57077	1	-9	22	-14	1
5	4	5.3839	25492	1	-9	22	-14	2
5	4	5.4636	35537	1	-9	22	-15	2
5	4	5.5492	35525	1	-9	22	-16	1
5	4	5.5238	17069	1	-9	22	-16	3
5	4	5.5806	2777	1	-9	22	-17	4
5	4	5.6568	3981	1	-9	22	-18	3
5	4	4.6231	11197	1	-9	23	-13	1
5	4	4.8274	26569	1	-9	23	-14	1
5	4	4.9744	40437	1	-9	23	-15	1
5	4	4.9474	19796	1	-9	23	-15	2
5	4	5.0718	30972	1	-9	23	-16	2

tr-des	des	max.zero	poly. disc.	poly. coefficients				
5	4	5.1961	44869	1	-9	23	-17	1
5	4	5.1581	19429	1	-9	23	-17	3
5	4	5.2867	24417	1	-9	23	-18	1
5	4	5.2703	30776	1	-9	23	-18	2
5	4	5.3388	17989	1	-9	23	-19	3
5	4	4.4005	6809	1	-9	24	-17	2
5	4	4.6954	28669	1	-9	24	-18	1
5	4	4.6113	9909	1	-9	24	-18	3
5	4	4.8517	31288	1	-9	24	-19	1
5	4	4.8224	27329	1	-9	24	-19	2
5	4	4.7580	7537	1	-9	24	-19	4
5	4	4.9773	16357	1	-9	24	-20	1
5	4	4.9537	23252	1	-9	24	-20	2
5	4	4.9291	22221	1	-9	24	-20	3
5	4	4.8760	2525	1	-9	24	-20	5
5	4	5.0437	13068	1	-9	24	-21	3
5	4	5.0223	15529	1	-9	24	-21	4
5	4	5.1058	8789	1	-9	24	-22	5
5	4	4.3528	12357	1	-9	25	-21	1
5	4	4.2784	8468	1	-9	25	-21	2
5	4	4.1796	3981	1	-9	25	-21	3
5	4	4.5795	10889	1	-9	25	-22	1
5	4	4.5374	13768	1	-9	25	-22	2
5	4	4.4383	8900	1	-9	25	-22	4
5	4	4.6764	8957	1	-9	25	-23	3
5	4	4.6412	11348	1	-9	25	-23	4
5	4	4.6031	9301	1	-9	25	-23	5
5	4	4.7625	6809	1	-9	25	-24	5
5	4	4.8405	4205	1	-9	25	-25	7
5	4	3.8271	1125	1	-9	26	-24	1
5	4	4.2840	3981	1	-9	26	-26	5
5	4	4.1268	1957	1	-9	26	-26	7
5	4	4.3623	2777	1	-9	26	-27	8
5	4	4.5231	1957	1	-9	26	-28	9
5	4	4.0953	725	1	-9	27	-31	11
5	5	6.1940	38569	1	-10	28	-29	10	-1
5	5	5.7544	38569	1	-10	29	-28	10	-1
5	5	5.8970	89417	1	-10	29	-30	10	-1
5	5	5.9506	233489	1	-10	29	-31	11	-1
5	5	6.0017	24217	1	-10	29	-32	12	-1
5	5	5.3213	89417	1	-10	30	-29	10	-1
5	5	5.6853	117688	1	-10	30	-33	11	-1
5	5	5.6715	530193	1	-10	30	-33	12	-1
5	5	5.7343	347317	1	-10	30	-34	13	-1
5	5	4.7281	24217	1	-10	31	-31	11	-1
5	5	5.1339	307145	1	-10	31	-33	11	-1
5	5	5.2635	224773	1	-10	31	-34	11	-1
5	5	5.2406	625433	1	-10	31	-34	12	-1
5	5	5.3732	36497	1	-10	31	-35	11	-1
5	5	5.3339	763945	1	-10	31	-35	13	-1
5	5	5.4353	301117	1	-10	31	-36	13	-1
5	5	5.4176	687329	1	-10	31	-36	14	-1
5	5	5.4938	357977	1	-10	31	-37	15	-1
5	5	5.4804	176684	1	-10	31	-37	16	-2
5	5	4.3554	38569	1	-10	32	-35	12	-1
5	5	4.7430	301909	1	-10	32	-36	12	-1
5	5	4.6880	339509	1	-10	32	-36	13	-1
5	5	4.9424	294577	1	-10	32	-37	12	-1
5	5	4.9071	617176	1	-10	32	-37	13	-1

tr-des	des	max.zero	poly. disc.	poly. coefficients					
5	5	4.8691	612569	1	-10	32	-37	14	-1
5	5	5.0361	729621	1	-10	32	-38	14	-1
5	5	5.0062	756781	1	-10	32	-38	15	-1
5	5	4.9809	179024	1	-10	32	-38	16	-2
5	5	5.1449	420460	1	-10	32	-39	15	-1
5	5	5.1199	706481	1	-10	32	-39	16	-1
5	5	5.0990	324301	1	-10	32	-39	17	-2
5	5	5.2186	356789	1	-10	32	-40	17	-1
5	5	5.2005	303952	1	-10	32	-40	18	-2
5	5	5.2742	65657	1	-10	32	-41	20	-3
5	5	4.5746	24217	1	-10	33	-40	12	-1
5	5	4.5112	186037	1	-10	33	-40	13	-1
5	5	4.4344	288385	1	-10	33	-40	14	-1
5	5	4.3329	220669	1	-10	33	-40	15	-1
5	5	4.1555	38569	1	-10	33	-40	16	-1
5	5	4.6620	427569	1	-10	33	-41	15	-1
5	5	4.6087	580484	1	-10	33	-41	16	-1
5	5	4.5472	416249	1	-10	33	-41	17	-1
5	5	4.7830	488149	1	-10	33	-42	17	-1
5	5	4.7414	580017	1	-10	33	-42	18	-1
5	5	4.7505	265504	1	-10	33	-42	18	-2
5	5	4.7056	331312	1	-10	33	-42	19	-2
5	5	4.6667	65657	1	-10	33	-42	20	-3
5	5	4.8863	373057	1	-10	33	-43	19	-1
5	5	4.8590	341692	1	-10	33	-43	20	-2
5	5	4.8302	161121	1	-10	33	-43	21	-3
5	5	4.9598	124817	1	-10	33	-44	22	-3
5	5	4.0541	81589	1	-10	34	-44	16	-1
5	5	4.3235	144209	1	-10	34	-45	18	-1
5	5	4.2232	245992	1	-10	34	-45	19	-1
5	5	4.0666	89417	1	-10	34	-45	20	-1
5	5	4.4304	307829	1	-10	34	-46	21	-1
5	5	4.3721	223952	1	-10	34	-46	22	-2
5	5	4.5497	149169	1	-10	34	-47	24	-3
5	5	4.5047	81589	1	-10	34	-47	25	-4
5	5	4.0385	38569	1	-10	35	-50	24	-1
5	5	4.1744	24217	1	-10	35	-51	27	-1
5	5	4.0431	24217	1	-10	35	-51	29	-5
5	6	4.5993	966125	1	-11	42	-67	45	-12	1
5	6	4.8452	1134389	1	-11	42	-68	46	-12	1
5	6	4.8031	1387029	1	-11	42	-68	47	-13	1
5	6	4.3293	1134389	1	-11	43	-72	50	-13	1
5	6	4.1890	592661	1	-11	43	-72	51	-14	1
5	6	4.5302	905177	1	-11	43	-73	53	-15	1
5	6	4.6970	966125	1	-11	43	-74	55	-14	1
5	6	4.1604	980125	1	-11	44	-78	59	-15	1
5	6	3.9777	453789	1	-11	44	-78	60	-16	1
5	6	4.2962	1134389	1	-11	44	-79	63	-18	1
5	6	3.7709	371293	1	-11	45	-84	70	-21	1
6	1	7.0000	1	1	-7				
6	2	7.8730	60	1	-8	1			
6	2	7.7417	56	1	-8	2			
6	2	7.6056	52	1	-8	3			
6	2	7.4641	48	1	-8	4			
6	2	7.3166	44	1	-8	5			
6	2	7.1623	40	1	-8	6			
6	2	6.8284	32	1	-8	8			

tr-des	des	max.zero	poly. disc.	poly. coefficients			
6	2	6.6458	28	1	-8	9	
6	2	6.4495	24	1	-8	10	
6	2	6.2361	20	1	-8	11	
6	2	5.7321	12	1	-8	13	
6	2	5.4142	8	1	-8	14	
6	3	8.2909	81	1	-9	6	-1
6	3	8.1569	788	1	-9	7	-1
6	3	8.0178	1489	1	-9	8	-1
6	3	7.8917	621	1	-9	9	-2
6	3	7.7217	2777	1	-9	10	-1
6	3	7.5630	3316	1	-9	11	-1
6	3	7.5844	2101	1	-9	11	-2
6	3	7.3957	3753	1	-9	12	-1
6	3	7.4188	2700	1	-9	12	-2
6	3	7.4416	1593	1	-9	12	-3
6	3	7.2182	4064	1	-9	13	-1
6	3	7.2434	3173	1	-9	13	-2
6	3	7.2682	2228	1	-9	13	-3
6	3	7.2926	1229	1	-9	13	-4
6	3	7.0283	4225	1	-9	14	-1
6	3	7.0561	3496	1	-9	14	-2
6	3	7.0833	2713	1	-9	14	-3
6	3	7.1101	1876	1	-9	14	-4
6	3	7.1364	985	1	-9	14	-5
6	3	6.8231	4212	1	-9	15	-1
6	3	6.8845	3024	1	-9	15	-3
6	3	6.9142	2349	1	-9	15	-4
6	3	6.9434	1620	1	-9	15	-5
6	3	6.9720	837	1	-9	15	-6
6	3	6.5980	4001	1	-9	16	-1
6	3	6.6334	3596	1	-9	16	-2
6	3	6.6679	3137	1	-9	16	-3
6	3	6.7344	2057	1	-9	16	-5
6	3	6.7664	1436	1	-9	16	-6
6	3	6.7978	761	1	-9	16	-7
6	3	6.3460	3568	1	-9	17	-1
6	3	6.3876	3325	1	-9	17	-2
6	3	6.4279	3028	1	-9	17	-3
6	3	6.4669	2677	1	-9	17	-4
6	3	6.5047	2272	1	-9	17	-5
6	3	6.5771	1300	1	-9	17	-7
6	3	6.6119	733	1	-9	17	-8
6	3	6.0541	2889	1	-9	18	-1
6	3	6.1055	2808	1	-9	18	-2
6	3	6.1545	2673	1	-9	18	-3
6	3	6.2015	2484	1	-9	18	-4
6	3	6.2466	2241	1	-9	18	-5
6	3	6.2899	1944	1	-9	18	-6
6	3	6.3318	1593	1	-9	18	-7
6	3	6.4115	729	1	-9	18	-9
6	3	5.6940	1940	1	-9	19	-1
6	3	5.7637	2021	1	-9	19	-2
6	3	5.8890	2021	1	-9	19	-4
6	3	5.9460	1940	1	-9	19	-5
6	3	6.0514	1616	1	-9	19	-7
6	3	6.1004	1373	1	-9	19	-8
6	3	6.1474	1076	1	-9	19	-9
6	3	5.1660	697	1	-9	20	-1
6	3	5.2924	940	1	-9	20	-2

tr-des	des	max.zero	poly. disc.	poly. coefficients			
6	3	5.3977	1129	1	-9	20	-3
6	3	5.4893	1264	1	-9	20	-4
6	3	5.5712	1345	1	-9	20	-5
6	3	5.7145	1345	1	-9	20	-7
6	3	5.7785	1264	1	-9	20	-8
6	3	5.8385	1129	1	-9	20	-9
6	3	5.8951	940	1	-9	20	-10
6	3	5.9488	697	1	-9	20	-11
6	3	6.0489	49	1	-9	20	-13
6	3	5.1451	621	1	-9	21	-6
6	3	5.2618	756	1	-9	21	-7
6	3	5.3615	837	1	-9	21	-8
6	3	5.5289	837	1	-9	21	-10
6	3	5.6017	756	1	-9	21	-11
6	3	5.6691	621	1	-9	21	-12
6	3	4.8342	257	1	-9	22	-9
6	3	5.1284	473	1	-9	22	-11
6	3	5.3301	473	1	-9	22	-13
6	3	5.4909	257	1	-9	22	-15
6	3	4.6751	148	1	-9	23	-13
6	3	4.8608	229	1	-9	23	-14
6	3	5.1149	229	1	-9	23	-16
6	3	5.2143	148	1	-9	23	-17
6	3	4.5321	81	1	-9	24	-17
6	3	4.8794	81	1	-9	24	-19
6	4	7.9974	10512	1	-10	17	-8	1
6	4	7.8294	6224	1	-10	18	-8	1
6	4	7.8513	25717	1	-10	18	-9	1
6	4	7.6750	35537	1	-10	19	-9	1
6	4	7.6985	41984	1	-10	19	-10	1
6	4	7.4868	33709	1	-10	20	-9	1
6	4	7.5126	65856	1	-10	20	-10	1
6	4	7.5380	62109	1	-10	20	-11	1
6	4	7.5598	14656	1	-10	20	-12	2
6	4	7.2840	23377	1	-10	21	-9	1
6	4	7.3127	74304	1	-10	21	-10	1
6	4	7.3409	98537	1	-10	21	-11	1
6	4	7.3686	87952	1	-10	21	-12	1
6	4	7.3648	7232	1	-10	21	-12	2
6	4	7.3921	33097	1	-10	21	-13	2
6	4	7.0626	8069	1	-10	22	-9	1
6	4	7.0951	70400	1	-10	22	-10	1
6	4	7.1269	114629	1	-10	22	-11	1
6	4	7.1580	133712	1	-10	22	-12	1
6	4	7.1884	119957	1	-10	22	-13	1
6	4	7.2141	56144	1	-10	22	-14	2
6	4	7.2394	12357	1	-10	22	-15	3
6	4	6.8908	113337	1	-10	23	-11	1
6	4	6.9266	152944	1	-10	23	-12	1
6	4	6.9613	169809	1	-10	23	-13	1
6	4	6.9564	26569	1	-10	23	-13	2
6	4	6.9952	156672	1	-10	23	-14	1
6	4	6.9904	71696	1	-10	23	-14	2
6	4	7.0606	8112	1	-10	23	-16	1
6	4	7.0515	32368	1	-10	23	-16	3
6	4	6.5801	39744	1	-10	24	-10	1
6	4	6.6241	97997	1	-10	24	-11	1
6	4	6.6666	148432	1	-10	24	-12	1
6	4	6.7076	185517	1	-10	24	-13	1

tr-des	des	max.zero	poly. disc.	poly. coefficients			
6	4	6.7473	203072	1 −10	24 −14	1
6	4	6.7415	65232	1 −10	24 −14	2
6	4	6.7857	194269	1 −10	24 −15	1
6	4	6.7801	104693	1 −10	24 −15	2
6	4	6.8176	116032	1 −10	24 −16	2
6	4	6.8122	25808	1 −10	24 −16	3
6	4	6.8593	67037	1 −10	24 −17	1
6	4	6.8488	56749	1 −10	24 −17	3
6	4	6.8896	21200	1 −10	24 −18	2
6	4	6.2543	21056	1 −10	25 −10	1
6	4	6.3107	72329	1 −10	25 −11	1
6	4	6.3641	123344	1 −10	25 −12	1
6	4	6.4150	169649	1 −10	25 −13	1
6	4	6.4636	206144	1 −10	25 −14	1
6	4	6.4562	45296	1 −10	25 −14	2
6	4	6.5101	227081	1 −10	25 −15	1
6	4	6.5031	97473	1 −10	25 −15	2
6	4	6.5549	226064	1 −10	25 −16	1
6	4	6.5482	133696	1 −10	25 −16	2
6	4	6.5915	146921	1 −10	25 −17	2
6	4	6.5851	55585	1 −10	25 −17	3
6	4	6.6396	129344	1 −10	25 −18	1
6	4	6.6272	83520	1 −10	25 −18	3
6	4	6.6799	17609	1 −10	25 −19	1
6	4	6.6619	35537	1 −10	25 −19	4
6	4	6.7074	31312	1 −10	25 −20	3
6	4	6.6957	2000	1 −10	25 −20	5
6	4	6.7400	2777	1 −10	25 −21	4
6	4	5.9121	40437	1 −10	26 −11	1
6	4	5.9880	81232	1 −10	26 −12	1
6	4	6.0577	125157	1 −10	26 −13	1
6	4	6.1225	168192	1 −10	26 −14	1
6	4	6.1122	21200	1 −10	26 −14	2
6	4	6.1831	205669	1 −10	26 −15	1
6	4	6.1736	71293	1 −10	26 −15	2
6	4	6.2403	232272	1 −10	26 −16	1
6	4	6.2313	116800	1 −10	26 −16	2
6	4	6.2944	242037	1 −10	26 −17	1
6	4	6.2860	151757	1 −10	26 −17	2
6	4	6.2775	35013	1 −10	26 −17	3
6	4	6.3380	169552	1 −10	26 −18	2
6	4	6.3299	80448	1 −10	26 −18	3
6	4	6.3952	183957	1 −10	26 −19	1
6	4	6.3800	107749	1 −10	26 −19	3
6	4	6.4423	100944	1 −10	26 −20	1
6	4	6.4351	123968	1 −10	26 −20	2
6	4	6.4206	57600	1 −10	26 −20	4
6	4	6.4739	75669	1 −10	26 −21	3
6	4	6.4598	19429	1 −10	26 −21	5
6	4	6.5479	12197	1 −10	26 −23	5
6	4	5.2460	6809	1 −10	27 −11	1
6	4	5.4229	26032	1 −10	27 −12	1
6	4	5.5549	55377	1 −10	27 −13	1
6	4	5.6638	91904	1 −10	27 −14	1
6	4	5.7582	132025	1 −10	27 −15	1
6	4	5.7426	35537	1 −10	27 −15	2
6	4	5.8422	171504	1 −10	27 −16	1
6	4	5.9186	205457	1 −10	27 −17	1
6	4	5.9061	113481	1 −10	27 −17	2
6	4	5.8934	10273	1 −10	27 −17	3

tr-des	des	max.zero	poly. disc.	poly. coefficients				
6	4	5.9888	228352	1	-10	27	-18	1
6	4	5.9774	148496	1	-10	27	-18	2
6	4	5.9659	53568	1	-10	27	-18	3
6	4	6.0436	172849	1	-10	27	-19	2
6	4	6.1152	215600	1	-10	27	-20	1
6	4	6.0956	121072	1	-10	27	-20	3
6	4	6.0856	41216	1	-10	27	-20	4
6	4	6.1729	165649	1	-10	27	-21	1
6	4	6.1638	161609	1	-10	27	-21	2
6	4	6.1452	75289	1	-10	27	-21	4
6	4	6.2276	76032	1	-10	27	-22	1
6	4	6.2190	110416	1	-10	27	-22	2
6	4	6.2103	114368	1	-10	27	-22	3
6	4	6.2632	62473	1	-10	27	-23	3
6	4	6.2549	74849	1	-10	27	-23	4
6	4	6.2381	7537	1	-10	27	-23	6
6	4	6.2980	43376	1	-10	27	-24	5
6	4	6.3797	2624	1	-10	27	-26	7
6	4	4.9224	8525	1	-10	28	-15	1
6	4	5.1999	45392	1	-10	28	-16	1
6	4	5.1601	14656	1	-10	28	-16	2
6	4	5.3655	87149	1	-10	28	-17	1
6	4	5.3382	40709	1	-10	28	-17	2
6	4	5.4934	129344	1	-10	28	-18	1
6	4	5.4719	74064	1	-10	28	-18	2
6	4	5.6005	166877	1	-10	28	-19	1
6	4	5.5825	109621	1	-10	28	-19	2
6	4	5.5639	48173	1	-10	28	-19	3
6	4	5.6783	141632	1	-10	28	-20	2
6	4	5.6623	81232	1	-10	28	-20	3
6	4	5.7776	204317	1	-10	28	-21	1
6	4	5.7495	111213	1	-10	28	-21	3
6	4	5.7349	48389	1	-10	28	-21	4
6	4	5.8538	190784	1	-10	28	-22	1
6	4	5.8412	168784	1	-10	28	-22	2
6	4	5.8154	79184	1	-10	28	-22	4
6	4	5.8020	14656	1	-10	28	-22	5
6	4	5.9241	145709	1	-10	28	-23	1
6	4	5.9126	149189	1	-10	28	-23	2
6	4	5.9009	133117	1	-10	28	-23	3
6	4	5.8769	48461	1	-10	28	-23	5
6	4	5.9895	60752	1	-10	28	-24	1
6	4	5.9789	96576	1	-10	28	-24	2
6	4	5.9681	109008	1	-10	28	-24	3
6	4	5.9571	99584	1	-10	28	-24	4
6	4	5.9347	21312	1	-10	28	-24	6
6	4	6.0309	49757	1	-10	28	-25	3
6	4	6.0208	71861	1	-10	28	-25	4
6	4	6.0105	69805	1	-10	28	-25	5
6	4	6.0710	38720	1	-10	28	-26	5
6	4	6.0612	44752	1	-10	28	-26	6
6	4	6.1098	24749	1	-10	28	-27	7
6	4	4.9458	34704	1	-10	29	-20	1
6	4	4.8800	16448	1	-10	29	-20	2
6	4	5.1307	56137	1	-10	29	-21	2
6	4	5.0919	30273	1	-10	29	-21	3
6	4	5.3183	124992	1	-10	29	-22	1
6	4	5.2651	61504	1	-10	29	-22	3
6	4	5.4403	150057	1	-10	29	-23	1
6	4	5.4194	123425	1	-10	29	-23	2

tr-des	des	max.zero	poly. disc.	poly. coefficients			
6	4	5.3750	55665	1 -10	29 -23	4
6	4	5.3513	17609	1 -10	29 -23	5
6	4	5.5443	152272	1 -10	29 -24	1
6	4	5.5265	137152	1 -10	29 -24	2
6	4	5.5082	112848	1 -10	29 -24	3
6	4	5.4697	42832	1 -10	29 -24	5
6	4	5.6359	123729	1 -10	29 -25	1
6	4	5.6203	127273	1 -10	29 -25	2
6	4	5.5880	96825	1 -10	29 -25	4
6	4	5.5539	26569	1 -10	29 -25	6
6	4	5.7184	55872	1 -10	29 -26	1
6	4	5.7045	85232	1 -10	29 -26	2
6	4	5.6903	97728	1 -10	29 -26	3
6	4	5.6758	94896	1 -10	29 -26	4
6	4	5.6609	78272	1 -10	29 -26	5
6	4	5.6302	9792	1 -10	29 -26	7
6	4	5.7684	43449	1 -10	29 -27	3
6	4	5.7553	65905	1 -10	29 -27	4
6	4	5.7420	70729	1 -10	29 -27	5
6	4	5.7284	59457	1 -10	29 -27	6
6	4	5.8163	33424	1 -10	29 -28	5
6	4	5.8039	46912	1 -10	29 -28	6
6	4	5.8621	24417	1 -10	29 -29	7
6	4	5.8504	26873	1 -10	29 -29	8
6	4	5.9063	14400	1 -10	29 -30	9
6	4	4.6301	11344	1 -10	30 -24	1
6	4	4.9579	62181	1 -10	30 -25	1
6	4	4.9107	45373	1 -10	30 -25	2
6	4	4.8564	29237	1 -10	30 -25	3
6	4	4.7064	5125	1 -10	30 -25	5
6	4	5.1407	91904	1 -10	30 -26	1
6	4	5.1095	79056	1 -10	30 -26	2
6	4	5.0759	63040	1 -10	30 -26	3
6	4	5.0397	45392	1 -10	30 -26	4
6	4	4.9559	11344	1 -10	30 -26	6
6	4	5.2796	92389	1 -10	30 -27	1
6	4	5.2554	90941	1 -10	30 -27	2
6	4	5.2300	82485	1 -10	30 -27	3
6	4	5.2033	68557	1 -10	30 -27	4
6	4	5.1750	50693	1 -10	30 -27	5
6	4	5.1131	9301	1 -10	30 -27	7
6	4	5.3948	54864	1 -10	30 -28	1
6	4	5.3747	72256	1 -10	30 -28	2
6	4	5.3322	76032	1 -10	30 -28	4
6	4	5.3098	65488	1 -10	30 -28	5
6	4	5.2863	48704	1 -10	30 -28	6
6	4	5.4595	42565	1 -10	30 -29	3
6	4	5.4412	58397	1 -10	30 -29	4
6	4	5.4222	62613	1 -10	30 -29	5
6	4	5.3824	42341	1 -10	30 -29	7
6	4	5.5201	32000	1 -10	30 -30	5
6	4	5.5032	44496	1 -10	30 -30	6
6	4	5.4858	44608	1 -10	30 -30	7
6	4	5.4679	33872	1 -10	30 -30	8
6	4	5.5773	23301	1 -10	30 -31	7
6	4	5.5454	24917	1 -10	30 -31	9
6	4	5.6314	15952	1 -10	30 -32	9
6	4	5.6167	16448	1 -10	30 -32	10
6	4	5.6829	8789	1 -10	30 -33	11
6	4	4.7480	35537	1 -10	31 -29	1

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6	4	4.6050	16609	1	-10	31	-29	3	
6	4	4.9654	41984	1	-10	31	-30	1	
6	4	4.9281	44688	1	-10	31	-30	2	
6	4	4.8874	42048	1	-10	31	-30	3	
6	4	4.8422	35600	1	-10	31	-30	4	
6	4	4.6597	8768	1	-10	31	-30	7	
6	4	5.1215	2777	1	-10	31	-31	1	
6	4	5.0333	42305	1	-10	31	-31	4	
6	4	4.9642	35537	1	-10	31	-31	6	
6	4	4.9252	26825	1	-10	31	-31	7	
6	4	4.8823	16609	1	-10	31	-31	8	
6	4	5.1518	30512	1	-10	31	-32	5	
6	4	5.0965	35312	1	-10	31	-32	7	
6	4	5.0664	28928	1	-10	31	-32	8	
6	4	5.0344	18736	1	-10	31	-32	9	
6	4	5.2306	23297	1	-10	31	-33	7	
6	4	5.2068	28473	1	-10	31	-33	8	
6	4	5.1559	17417	1	-10	31	-33	10	
6	4	5.2814	19664	1	-10	31	-34	10	
6	4	5.2592	14272	1	-10	31	-34	11	
6	4	5.3696	10889	1	-10	31	-35	11	
6	4	5.3502	10273	1	-10	31	-35	12	
6	4	5.4321	5744	1	-10	31	-36	13	
6	4	4.5529	11197	1	-10	32	-33	1	
6	4	4.3636	7053	1	-10	32	-33	3	
6	4	4.5929	14656	1	-10	32	-34	5	
6	4	4.5166	11344	1	-10	32	-34	6	
6	4	4.8329	4205	1	-10	32	-35	5	
6	4	4.7453	16317	1	-10	32	-35	7	
6	4	4.6935	15317	1	-10	32	-35	8	
6	4	4.6337	11661	1	-10	32	-35	9	
6	4	4.4667	2525	1	-10	32	-35	11	
6	4	4.8260	14656	1	-10	32	-36	10	
6	4	4.7817	11344	1	-10	32	-36	11	
6	4	4.9688	11197	1	-10	32	-37	11	
6	4	4.8996	7053	1	-10	32	-37	13	
6	4	5.0590	7488	1	-10	32	-38	13	
6	4	5.0303	6224	1	-10	32	-38	14	
6	4	5.1401	3981	1	-10	32	-39	15	
6	4	4.2283	2624	1	-10	33	-38	7	
6	4	4.2631	2777	1	-10	33	-39	11	
6	4	4.4955	4752	1	-10	33	-40	13	
6	4	4.5962	2777	1	-10	33	-41	16	
6	4	4.7746	2624	1	-10	33	-42	17	
6	4	4.1935	725	1	-10	34	-45	19	
6	5	7.6232	38569	1	-11	29	-26	9	-1
6	5	7.2500	233489	1	-11	31	-29	10	-1
6	5	7.3172	24217	1	-11	31	-31	10	-1
6	5	7.3453	36497	1	-11	31	-32	11	-1
6	5	7.0571	36497	1	-11	32	-31	11	-1
6	5	7.1320	698569	1	-11	32	-33	11	-1
6	5	7.1630	541477	1	-11	32	-34	12	-1
6	5	6.7225	117688	1	-11	33	-30	10	-1
6	5	6.7704	307145	1	-11	33	-31	10	-1
6	5	6.8096	698569	1	-11	33	-32	11	-1
6	5	6.8970	1062137	1	-11	33	-34	11	-1
6	5	6.9384	246832	1	-11	33	-35	11	-1
6	5	6.9325	1788353	1	-11	33	-35	12	-1

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6	5	7.0008	419969	1	-11	33	-37	14	-1
6	5	6.4174	224773	1	-11	34	-31	10	-1
6	5	6.5258	1062137	1	-11	34	-33	11	-1
6	5	6.5720	528933	1	-11	34	-34	12	-1
6	5	6.6318	983729	1	-11	34	-35	11	-1
6	5	6.6812	223952	1	-11	34	-36	11	-1
6	5	6.7216	1539213	1	-11	34	-37	12	-1
6	5	6.7146	3190969	1	-11	34	-37	13	-1
6	5	6.7608	1192784	1	-11	34	-38	13	-1
6	5	6.7540	2787077	1	-11	34	-38	14	-1
6	5	6.7922	1696169	1	-11	34	-39	15	-1
6	5	6.7867	442552	1	-11	34	-39	16	-2
6	5	5.9380	36497	1	-11	35	-31	10	-1
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6	5	6.1825	983729	1	-11	35	-34	11	-1
6	5	6.2432	1182913	1	-11	35	-35	12	-1
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6	5	6.3003	70601	1	-11	35	-36	13	-1
6	5	6.3738	2940457	1	-11	35	-37	12	-1
6	5	6.3460	106069	1	-11	35	-37	15	-2
6	5	6.4331	2302312	1	-11	35	-38	12	-1
6	5	6.4241	4283361	1	-11	35	-38	13	-1
6	5	6.4893	1031001	1	-11	35	-39	12	-1
6	5	6.4722	4666849	1	-11	35	-39	14	-1
6	5	6.5346	912425	1	-11	35	-40	13	-1
6	5	6.5265	3328124	1	-11	35	-40	14	-1
6	5	6.5184	4288081	1	-11	35	-40	15	-1
6	5	6.5705	1652272	1	-11	35	-41	15	-1
6	5	6.5627	3300129	1	-11	35	-41	16	-1
6	5	6.5561	1284557	1	-11	35	-41	17	-2
6	5	6.6055	1706737	1	-11	35	-42	17	-1
6	5	6.5991	1233124	1	-11	35	-42	18	-2
6	5	6.6345	144209	1	-11	35	-43	20	-3
6	5	5.5704	223952	1	-11	36	-34	11	-1
6	5	5.7125	482689	1	-11	36	-35	11	-1
6	5	5.8098	1069765	1	-11	36	-36	12	-1
6	5	5.8957	819041	1	-11	36	-37	13	-1
6	5	6.0024	2344565	1	-11	36	-38	12	-1
6	5	6.0837	2070517	1	-11	36	-39	12	-1
6	5	6.0709	4209001	1	-11	36	-39	13	-1
6	5	6.1582	1296549	1	-11	36	-40	12	-1
6	5	6.1465	4338512	1	-11	36	-40	13	-1
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6	5	6.2055	5598157	1	-11	36	-41	14	-1
6	5	6.1944	5774177	1	-11	36	-41	15	-1
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6	5	6.3238	1797129	1	-11	36	-43	15	-1
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6	5	6.2960	2297532	1	-11	36	-43	18	-2
6	5	6.3646	1999312	1	-11	36	-44	17	-1
6	5	6.3553	3682181	1	-11	36	-44	18	-1
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tr-des	des	max.zero	poly. disc.	poly. coefficients
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6	5	6.3890	656721	1 -11 36 -45 21 -3
6	5	6.4365	528149	1 -11 36 -46 22 -3
6	5	5.1903	249689	1 -11 37 -38 13 -1
6	5	5.4553	903377	1 -11 37 -39 12 -1
6	5	5.3879	233489	1 -11 37 -39 14 -1
6	5	5.5802	2434273	1 -11 37 -40 13 -1
6	5	5.5051	135076	1 -11 37 -40 16 -2
6	5	5.7251	684617	1 -11 37 -41 12 -1
6	5	5.7054	3186608	1 -11 37 -41 13 -1
6	5	5.6850	3916001	1 -11 37 -41 14 -1
6	5	5.8116	3210073	1 -11 37 -42 13 -1
6	5	5.7943	5171576	1 -11 37 -42 14 -1
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6	5	5.9050	2411824	1 -11 37 -43 13 -1
6	5	5.8899	5143257	1 -11 37 -43 14 -1
6	5	5.8744	6641136	1 -11 37 -43 15 -1
6	5	5.8585	5792089	1 -11 37 -43 16 -1
6	5	5.8451	1122797	1 -11 37 -43 17 -2
6	5	5.9890	941633	1 -11 37 -44 13 -1
6	5	5.9755	3439124	1 -11 37 -44 14 -1
6	5	5.9617	6033113	1 -11 37 -44 15 -1
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6	5	5.9333	6059297	1 -11 37 -44 17 -1
6	5	5.9357	598729	1 -11 37 -44 17 -2
6	5	5.9211	2363492	1 -11 37 -44 18 -2
6	5	6.0283	5441617	1 -11 37 -45 16 -1
6	5	6.0154	7112624	1 -11 37 -45 17 -1
6	5	6.0022	5905433	1 -11 37 -45 18 -1
6	5	6.0044	2202656	1 -11 37 -45 18 -2
6	5	5.9911	3083197	1 -11 37 -45 19 -2
6	5	6.0906	2868777	1 -11 37 -46 17 -1
6	5	6.0786	5639208	1 -11 37 -46 18 -1
6	5	6.0665	5311081	1 -11 37 -46 19 -1
6	5	6.0685	2828449	1 -11 37 -46 19 -2
6	5	6.0561	3302660	1 -11 37 -46 20 -2
6	5	6.0457	726369	1 -11 37 -46 21 -3
6	5	6.1381	2517296	1 -11 37 -47 19 -1
6	5	6.1268	4100609	1 -11 37 -47 20 -1
6	5	6.1286	2233072	1 -11 37 -47 20 -2
6	5	6.1171	3016709	1 -11 37 -47 21 -2
6	5	6.1074	1361657	1 -11 37 -47 22 -3
6	5	6.1837	1815329	1 -11 37 -48 21 -1
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6	5	6.1764	404744	1 -11 37 -48 22 -3
6	5	6.1655	1404537	1 -11 37 -48 23 -3
6	5	6.2206	749769	1 -11 37 -49 24 -3
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6	5	5.1420	868097	1 -11 38 -43 13 -1
6	5	5.0853	1141637	1 -11 38 -43 14 -1
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6	5	5.2441	2306637	1 -11 38 -44 16 -1
6	5	5.2088	236549	1 -11 38 -44 17 -2
6	5	5.5060	1219961	1 -11 38 -45 13 -1
6	5	5.4809	3348733	1 -11 38 -45 14 -1
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tr-des	des	max.zero	poly. disc.	poly. coefficients				
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6	5	5.3716	1132684	1	-11	38	-45	18	-2
6	5	5.6294	609872	1	-11	38	-46	13	-1
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6	5	5.5877	5002240	1	-11	38	-46	15	-1
6	5	5.5656	6451829	1	-11	38	-46	16	-1
6	5	5.5426	6508112	1	-11	38	-46	17	-1
6	5	5.5186	4650757	1	-11	38	-46	18	-1
6	5	5.5230	1493248	1	-11	38	-46	18	-2
6	5	5.4981	2118789	1	-11	38	-46	19	-2
6	5	5.7176	904469	1	-11	38	-47	14	-1
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6	5	5.6620	7323977	1	-11	38	-47	17	-1
6	5	5.6422	7502509	1	-11	38	-47	18	-1
6	5	5.6218	5328369	1	-11	38	-47	19	-1
6	5	5.6254	2920360	1	-11	38	-47	19	-2
6	5	5.5865	288633	1	-11	38	-47	21	-3
6	5	5.7648	4248064	1	-11	38	-48	17	-1
6	5	5.7478	6788877	1	-11	38	-48	18	-1
6	5	5.7508	380224	1	-11	38	-48	18	-2
6	5	5.7304	7600592	1	-11	38	-48	19	-1
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6	5	5.6973	3516901	1	-11	38	-48	21	-2
6	5	5.6817	1217869	1	-11	38	-48	22	-3
6	5	5.8411	147109	1	-11	38	-49	18	-1
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6	5	5.7941	5492617	1	-11	38	-49	21	-1
6	5	5.7969	4127164	1	-11	38	-49	21	-2
6	5	5.7805	3756204	1	-11	38	-49	22	-2
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6	5	5.8564	3536069	1	-11	38	-50	23	-2
6	5	5.8590	1548112	1	-11	38	-50	23	-3
6	5	5.8439	2168373	1	-11	38	-50	24	-3
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6	5	5.9377	2199817	1	-11	38	-51	23	-1
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6	5	5.9287	1021221	1	-11	38	-51	24	-3
6	5	5.9149	1989409	1	-11	38	-51	25	-3
6	5	5.9033	971092	1	-11	38	-51	26	-4
6	5	5.9810	1002413	1	-11	38	-52	26	-3
6	5	5.9703	896581	1	-11	38	-52	27	-4
6	5	6.0228	249689	1	-11	38	-53	29	-5
6	5	4.6371	101833	1	-11	39	-47	14	-1
6	5	5.1110	38569	1	-11	39	-48	13	-1
6	5	5.0115	1786033	1	-11	39	-48	15	-1
6	5	4.9495	1901332	1	-11	39	-48	16	-1
6	5	4.8726	1447209	1	-11	39	-48	17	-1
6	5	4.7641	627484	1	-11	39	-48	18	-1
6	5	5.2680	951305	1	-11	39	-49	14	-1
6	5	5.2345	2337264	1	-11	39	-49	15	-1
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6	5	5.1593	4226768	1	-11	39	-49	17	-1

tr-des	des	max.zero	poly. disc.	poly. coefficients					
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6	5	5.0778	1024469	1	-11	39	-49	19	-2
6	5	5.0122	1726409	1	-11	39	-49	20	-1
6	5	5.0240	1258160	1	-11	39	-49	20	-2
6	5	4.9604	816117	1	-11	39	-49	21	-2
6	5	4.8984	157457	1	-11	39	-49	22	-3
6	5	5.3934	729281	1	-11	39	-50	15	-1
6	5	5.3666	2475624	1	-11	39	-50	16	-1
6	5	5.3384	4324465	1	-11	39	-50	17	-1
6	5	5.3086	5688944	1	-11	39	-50	18	-1
6	5	5.2769	6119025	1	-11	39	-50	19	-1
6	5	5.2830	1242937	1	-11	39	-50	19	-2
6	5	5.2429	5332216	1	-11	39	-50	20	-1
6	5	5.2495	2421988	1	-11	39	-50	20	-2
6	5	5.2061	3244289	1	-11	39	-50	21	-1
6	5	5.2134	2714521	1	-11	39	-50	21	-2
6	5	5.1741	1909636	1	-11	39	-50	22	-2
6	5	5.1395	753529	1	-11	39	-50	23	-3
6	5	5.4539	2930257	1	-11	39	-51	18	-1
6	5	5.4294	5377984	1	-11	39	-51	19	-1
6	5	5.4038	6772713	1	-11	39	-51	20	-1
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6	5	5.3768	6570832	1	-11	39	-51	21	-1
6	5	5.3820	3548613	1	-11	39	-51	21	-2
6	5	5.3484	4407025	1	-11	39	-51	22	-1
6	5	5.3241	2851069	1	-11	39	-51	23	-2
6	5	5.3298	1287152	1	-11	39	-51	23	-3
6	5	5.2985	1463481	1	-11	39	-51	24	-3
6	5	5.2716	147109	1	-11	39	-51	25	-4
6	5	5.5328	2233556	1	-11	39	-52	20	-1
6	5	5.5111	5318217	1	-11	39	-52	21	-1
6	5	5.4885	6481628	1	-11	39	-52	22	-1
6	5	5.4926	3683588	1	-11	39	-52	22	-2
6	5	5.4649	5065409	1	-11	39	-52	23	-1
6	5	5.4693	4511417	1	-11	39	-52	23	-2
6	5	5.4736	974241	1	-11	39	-52	23	-3
6	5	5.4449	3532836	1	-11	39	-52	24	-2
6	5	5.4242	2099273	1	-11	39	-52	25	-3
6	5	5.6051	726369	1	-11	39	-53	22	-1
6	5	5.5855	4343344	1	-11	39	-53	23	-1
6	5	5.5653	4822817	1	-11	39	-53	24	-1
6	5	5.5690	3899824	1	-11	39	-53	24	-2
6	5	5.5726	1255209	1	-11	39	-53	24	-3
6	5	5.5481	3743197	1	-11	39	-53	25	-2
6	5	5.5305	2510665	1	-11	39	-53	26	-3
6	5	5.5344	540304	1	-11	39	-53	26	-4
6	5	5.5123	1255781	1	-11	39	-53	27	-4
6	5	5.6543	2886769	1	-11	39	-54	25	-1
6	5	5.6392	3024292	1	-11	39	-54	26	-2
6	5	5.6425	1753772	1	-11	39	-54	26	-3
6	5	5.6237	2449737	1	-11	39	-54	27	-3
6	5	5.6271	954409	1	-11	39	-54	27	-4
6	5	5.6079	1545616	1	-11	39	-54	28	-4
6	5	5.5916	501289	1	-11	39	-54	29	-5
6	5	5.7075	1415969	1	-11	39	-55	28	-3
6	5	5.6934	1343261	1	-11	39	-55	29	-4
6	5	5.6789	767625	1	-11	39	-55	30	-5
6	5	5.7786	38569	1	-11	39	-56	29	-1
6	5	5.7581	516553	1	-11	39	-56	31	-5

tr-des	des	max.zero	poly. disc.	poly. coefficients				
6	5	4.5954	463477	1	-11	40	-52	16	-1
6	5	4.9621	638597	1	-11	40	-53	16	-1
6	5	4.9093	1478777	1	-11	40	-53	17	-1
6	5	4.8482	2019581	1	-11	40	-53	18	-1
6	5	4.7745	2008889	1	-11	40	-53	19	-1
6	5	4.6775	1385549	1	-11	40	-53	20	-1
6	5	4.7011	396520	1	-11	40	-53	20	-2
6	5	4.5101	310097	1	-11	40	-53	21	-1
6	5	5.0536	1933264	1	-11	40	-54	19	-1
6	5	5.0094	3275621	1	-11	40	-54	20	-1
6	5	5.0186	563792	1	-11	40	-54	20	-2
6	5	4.9601	3846464	1	-11	40	-54	21	-1
6	5	4.9038	3543781	1	-11	40	-54	22	-1
6	5	4.9160	1867840	1	-11	40	-54	22	-2
6	5	4.8373	2498000	1	-11	40	-54	23	-1
6	5	4.8521	1823261	1	-11	40	-54	23	-2
6	5	4.7534	1102709	1	-11	40	-54	24	-1
6	5	4.7730	1240016	1	-11	40	-54	24	-2
6	5	4.6628	422077	1	-11	40	-54	25	-2
6	5	4.6907	394064	1	-11	40	-54	25	-3
6	5	5.1709	1174809	1	-11	40	-55	21	-1
6	5	5.1356	3579733	1	-11	40	-55	22	-1
6	5	5.1427	1271932	1	-11	40	-55	22	-2
6	5	5.0975	4758345	1	-11	40	-55	23	-1
6	5	5.0559	4548309	1	-11	40	-55	24	-1
6	5	5.0728	740877	1	-11	40	-55	24	-3
6	5	5.0099	3030481	1	-11	40	-55	25	-1
6	5	5.0194	3034648	1	-11	40	-55	25	-2
6	5	5.0288	1480337	1	-11	40	-55	25	-3
6	5	4.9689	1932860	1	-11	40	-55	26	-2
6	5	4.9796	1636853	1	-11	40	-55	26	-3
6	5	4.9233	1083633	1	-11	40	-55	27	-3
6	5	4.8713	470752	1	-11	40	-55	28	-4
6	5	4.8098	65657	1	-11	40	-55	29	-5
6	5	5.2419	2807573	1	-11	40	-56	24	-1
6	5	5.2477	961616	1	-11	40	-56	24	-2
6	5	5.2105	4555472	1	-11	40	-56	25	-1
6	5	5.1769	4105829	1	-11	40	-56	26	-1
6	5	5.1835	3720448	1	-11	40	-56	26	-2
6	5	5.1901	1949893	1	-11	40	-56	26	-3
6	5	5.1480	3025637	1	-11	40	-56	27	-2
6	5	5.1551	2502096	1	-11	40	-56	27	-3
6	5	5.1621	414677	1	-11	40	-56	27	-4
6	5	5.1173	2000693	1	-11	40	-56	28	-3
6	5	5.0844	1123541	1	-11	40	-56	29	-4
6	5	5.3350	1284557	1	-11	40	-57	26	-1
6	5	5.3080	3467657	1	-11	40	-57	27	-1
6	5	5.3183	905337	1	-11	40	-57	27	-3
6	5	5.2851	3183304	1	-11	40	-57	28	-2
6	5	5.2611	2479569	1	-11	40	-57	29	-3
6	5	5.2668	1544456	1	-11	40	-57	29	-4
6	5	5.2421	398885	1	-11	40	-57	30	-5
6	5	5.2097	844417	1	-11	40	-57	31	-5
6	5	5.4037	179024	1	-11	40	-58	29	-3
6	5	5.3793	1918149	1	-11	40	-58	30	-3
6	5	5.3587	1687117	1	-11	40	-58	31	-4
6	5	5.3635	629584	1	-11	40	-58	31	-5
6	5	5.3373	1125317	1	-11	40	-58	32	-5
6	5	5.3151	463341	1	-11	40	-58	33	-6
6	5	5.4734	562169	1	-11	40	-59	31	-1

tr-des	des	max.zero	poly. disc.	poly. coefficients					
6	5	5.4453	862769	1	-11	40	-59	33	-5
6	5	5.4266	611084	1	-11	40	-59	34	-6
6	5	5.4072	124817	1	-11	40	-59	35	-7
6	5	5.5330	138917	1	-11	40	-60	34	-3
6	5	4.2818	180769	1	-11	41	-57	20	-1
6	5	4.6373	796520	1	-11	41	-58	22	-1
6	5	4.5364	1095497	1	-11	41	-58	23	-1
6	5	4.3730	470752	1	-11	41	-58	24	-1
6	5	4.4217	387268	1	-11	41	-58	24	-2
6	5	4.7649	1562544	1	-11	41	-59	25	-1
6	5	4.7783	630757	1	-11	41	-59	25	-2
6	5	4.6927	2112497	1	-11	41	-59	26	-1
6	5	4.7250	454057	1	-11	41	-59	26	-3
6	5	4.6008	1590832	1	-11	41	-59	27	-1
6	5	4.6437	737904	1	-11	41	-59	27	-3
6	5	4.4628	537921	1	-11	41	-59	28	-1
6	5	4.5011	708592	1	-11	41	-59	28	-2
6	5	4.5333	592041	1	-11	41	-59	28	-3
6	5	4.9220	466809	1	-11	41	-60	27	-1
6	5	4.8719	2338412	1	-11	41	-60	28	-1
6	5	4.8826	1413764	1	-11	41	-60	28	-2
6	5	4.8149	2443489	1	-11	41	-60	29	-1
6	5	4.8395	1363777	1	-11	41	-60	29	-3
6	5	4.8511	372289	1	-11	41	-60	29	-4
6	5	4.7631	1767652	1	-11	41	-60	30	-2
6	5	4.7775	1572696	1	-11	41	-60	30	-3
6	5	4.7028	1088761	1	-11	41	-60	31	-3
6	5	4.7200	904793	1	-11	41	-60	31	-4
6	5	4.7363	157457	1	-11	41	-60	31	-5
6	5	4.6291	540304	1	-11	41	-60	32	-4
6	5	4.5294	176281	1	-11	41	-60	33	-5
6	5	5.0082	1476577	1	-11	41	-61	30	-1
6	5	5.0163	423904	1	-11	41	-61	30	-2
6	5	4.9916	422069	1	-11	41	-61	31	-4
6	5	4.9181	307145	1	-11	41	-61	32	-1
6	5	4.9379	1819289	1	-11	41	-61	32	-3
6	5	4.9567	354969	1	-11	41	-61	32	-5
6	5	4.8982	1364413	1	-11	41	-61	33	-4
6	5	4.9087	834352	1	-11	41	-61	33	-5
6	5	4.8544	853137	1	-11	41	-61	34	-5
6	5	4.8054	414677	1	-11	41	-61	35	-6
6	5	4.7489	101833	1	-11	41	-61	36	-7
6	5	5.0867	1027081	1	-11	41	-62	33	-1
6	5	5.1007	530193	1	-11	41	-62	33	-3
6	5	5.0569	522052	1	-11	41	-62	34	-2
6	5	5.0790	442552	1	-11	41	-62	34	-5
6	5	5.0412	1070705	1	-11	41	-62	35	-5
6	5	5.0085	746052	1	-11	41	-62	36	-6
6	5	4.9734	354969	1	-11	41	-62	37	-7
6	5	5.1714	512433	1	-11	41	-63	36	-3
6	5	5.1454	81509	1	-11	41	-63	37	-4
6	5	5.1315	449617	1	-11	41	-63	38	-7
6	5	5.1036	186037	1	-11	41	-63	39	-8
6	5	5.2481	180769	1	-11	41	-64	39	-5
6	5	5.2125	36497	1	-11	41	-64	41	-9
6	5	4.1298	147109	1	-11	42	-63	28	-1
6	5	4.3894	582992	1	-11	42	-64	31	-1
6	5	4.4191	320837	1	-11	42	-64	31	-2
6	5	4.1853	210557	1	-11	42	-64	32	-1
6	5	4.2533	328784	1	-11	42	-64	32	-2

tr-des	des	max.zero	poly. disc.	poly. coefficients					
6	5	4.5723	666412	1	-11	42	-65	34	-2
6	5	4.4453	484105	1	-11	42	-65	35	-1
6	5	4.4978	712753	1	-11	42	-65	35	-3
6	5	4.5206	504568	1	-11	42	-65	35	-4
6	5	4.5418	205225	1	-11	42	-65	35	-5
6	5	4.3187	138136	1	-11	42	-65	36	-2
6	5	4.4323	355309	1	-11	42	-65	36	-5
6	5	4.2404	101833	1	-11	42	-65	37	-5
6	5	4.7447	450277	1	-11	42	-66	36	-1
6	5	4.6809	303952	1	-11	42	-66	37	-1
6	5	4.7226	186037	1	-11	42	-66	37	-4
6	5	4.6393	528149	1	-11	42	-66	38	-3
6	5	4.6708	541477	1	-11	42	-66	38	-5
6	5	4.5732	224773	1	-11	42	-66	39	-4
6	5	4.6287	207184	1	-11	42	-66	39	-7
6	5	4.5400	288565	1	-11	42	-66	40	-7
6	5	4.4481	106069	1	-11	42	-66	41	-8
6	5	4.7796	357977	1	-11	42	-67	41	-5
6	5	4.8026	233489	1	-11	42	-67	41	-7
6	5	4.7082	144209	1	-11	42	-67	43	-9
6	5	4.8940	170701	1	-11	42	-68	44	-7
6	5	4.9924	36497	1	-11	42	-69	47	-9
6	5	4.0912	117688	1	-11	43	-70	40	-1
6	5	4.1515	135076	1	-11	43	-70	40	-2
6	5	4.0851	65657	1	-11	43	-70	41	-5
6	5	4.4368	36497	1	-11	43	-71	42	-1
6	5	4.3127	176281	1	-11	43	-71	44	-5
6	5	4.2684	81509	1	-11	43	-71	45	-8
6	5	4.1064	36497	1	-11	43	-71	46	-9
6	5	4.5100	70601	1	-11	43	-72	47	-7
6	5	4.3476	65657	1	-11	43	-72	49	-9
6	5	4.4039	38569	1	-11	43	-72	49	-11
6	5	4.5441	38569	1	-11	43	-73	52	-11
6	5	3.9190	14641	1	-11	44	-77	55	-11
6	6	6.9041	434581	1	-12	44	-67	44	-12	1
6	6	6.5442	966125	1	-12	45	-67	42	-11	1
6	6	6.6896	2666432	1	-12	45	-70	46	-12	1
6	6	6.1331	1134389	1	-12	46	-68	42	-11	1
6	6	6.2673	2666432	1	-12	46	-70	45	-12	1
6	6	6.3330	12483261	1	-12	46	-71	46	-12	1
6	6	6.3945	7649984	1	-12	46	-72	47	-12	1
6	6	6.3851	5160733	1	-12	46	-72	48	-13	1
6	6	6.4908	3662336	1	-12	46	-74	51	-14	1
6	6	5.8501	7649984	1	-12	47	-72	47	-12	1
6	6	5.9467	10121113	1	-12	47	-73	47	-12	1
6	6	6.0490	8498752	1	-12	47	-74	47	-12	1
6	6	6.0192	18011069	1	-12	47	-74	49	-13	1
6	6	6.1257	2661761	1	-12	47	-75	48	-12	1
6	6	6.0988	31967893	1	-12	47	-75	50	-13	1
6	6	6.1719	26327997	1	-12	47	-76	51	-13	1
6	6	6.1605	25935680	1	-12	47	-76	52	-14	1
6	6	6.2398	1279733	1	-12	47	-77	52	-13	1
6	6	6.2185	2990117	1	-12	47	-77	54	-15	1
6	6	6.3315	1312625	1	-12	47	-79	57	-14	1
6	6	5.3903	2661761	1	-12	48	-75	48	-12	1
6	6	5.3450	1292517	1	-12	48	-75	48	-12	1
6	6	5.3039	1312625	1	-12	48	-75	49	-13	1
6	6	5.4919	14978149	1	-12	48	-76	50	-13	1
6	6	5.7041	3916917	1	-12	48	-77	48	-12	1

tr-des	des	max.zero	poly. disc.	poly. coefficients						
6	6	5.6588	4758548	1	-12	48	-77	50	-13	1
6	6	5.6323	27339617	1	-12	48	-77	51	-13	1
6	6	5.6095	8047141	1	-12	48	-77	52	-14	1
6	6	5.7702	23790953	1	-12	48	-78	51	-13	1
6	6	5.7481	30073325	1	-12	48	-78	52	-13	1
6	6	5.7292	38564352	1	-12	48	-78	53	-14	1
6	6	5.8672	17501524	1	-12	48	-79	52	-13	1
6	6	5.8481	19303153	1	-12	48	-79	53	-13	1
6	6	5.8514	4601153	1	-12	48	-79	53	-14	1
6	6	5.8319	56844101	1	-12	48	-79	54	-14	1
6	6	5.8151	23102993	1	-12	48	-79	55	-15	1
6	6	5.9371	2415125	1	-12	48	-80	54	-13	1
6	6	5.9227	44692288	1	-12	48	-80	55	-14	1
6	6	5.9080	50364533	1	-12	48	-80	56	-15	1
6	6	5.9782	23957597	1	-12	48	-81	58	-16	1
6	6	5.9529	3389609	1	-12	48	-81	60	-19	2
6	6	6.0510	3662336	1	-12	48	-82	59	-14	1
6	6	6.0385	1397493	1	-12	48	-82	60	-15	1
6	6	6.0435	1134389	1	-12	48	-82	60	-17	1
6	6	6.1001	9117749	1	-12	48	-83	62	-16	1
6	6	4.9544	3455125	1	-12	49	-80	53	-13	1
6	6	4.8391	2666432	1	-12	49	-80	54	-14	1
6	6	5.3326	11035429	1	-12	49	-81	52	-13	1
6	6	5.2438	5160733	1	-12	49	-81	54	-13	1
6	6	5.2531	14469145	1	-12	49	-81	54	-14	1
6	6	5.2016	28145473	1	-12	49	-81	55	-14	1
6	6	5.1544	14538437	1	-12	49	-81	56	-15	1
6	6	5.4856	10133605	1	-12	49	-82	53	-13	1
6	6	5.4543	9596117	1	-12	49	-82	54	-13	1
6	6	5.4273	37829376	1	-12	49	-82	55	-14	1
6	6	5.3920	49619392	1	-12	49	-82	56	-14	1
6	6	5.3612	49276325	1	-12	49	-82	57	-15	1
6	6	5.3282	7633856	1	-12	49	-82	58	-16	1
6	6	5.5628	31073233	1	-12	49	-83	56	-14	1
6	6	5.5352	49567097	1	-12	49	-83	57	-14	1
6	6	5.5403	23468204	1	-12	49	-83	57	-15	1
6	6	5.5114	77117277	1	-12	49	-83	58	-15	1
6	6	5.4866	49973113	1	-12	49	-83	59	-16	1
6	6	5.4382	4823921	1	-12	49	-83	61	-19	2
6	6	5.6534	14631616	1	-12	49	-84	58	-14	1
6	6	5.6337	59561669	1	-12	49	-84	59	-15	1
6	6	5.6134	72412864	1	-12	49	-84	60	-16	1
6	6	5.5924	29646901	1	-12	49	-84	61	-17	1
6	6	5.5745	3389609	1	-12	49	-84	62	-19	2
6	6	5.6957	21631861	1	-12	49	-85	62	-15	1
6	6	5.7035	37317685	1	-12	49	-85	62	-17	1
6	6	5.6851	1312625	1	-12	49	-85	63	-18	1
6	6	5.6695	12202292	1	-12	49	-85	64	-20	2
6	6	5.7941	3184733	1	-12	49	-86	63	-15	1
6	6	5.7779	32059584	1	-12	49	-86	64	-16	1
6	6	5.7613	16831813	1	-12	49	-86	65	-17	1
6	6	5.8946	8420544	1	-12	49	-88	70	-20	1
6	6	4.6699	3086597	1	-12	50	-85	56	-14	1
6	6	4.9972	2286997	1	-12	50	-86	58	-14	1
6	6	4.9022	13009408	1	-12	50	-86	59	-14	1
6	6	4.9203	25431097	1	-12	50	-86	59	-15	1
6	6	4.8184	20237501	1	-12	50	-86	60	-15	1
6	6	4.8426	4141568	1	-12	50	-86	60	-16	1
6	6	4.6929	7649984	1	-12	50	-86	61	-16	1
6	6	5.2084	11120233	1	-12	50	-87	59	-14	1

tr-des	des	max.zero	poly. disc.	poly. coefficients						
6	6	5.1624	13424893	1	-12	50	-87	60	-14	1
6	6	5.1717	38759348	1	-12	50	-87	60	-15	1
6	6	5.1216	56224097	1	-12	50	-87	61	-15	1
6	6	5.1318	32830081	1	-12	50	-87	61	-16	1
6	6	5.0764	64778125	1	-12	50	-87	62	-16	1
6	6	4.9970	3486377	1	-12	50	-87	63	-15	1
6	6	5.0254	43074529	1	-12	50	-87	63	-17	1
6	6	4.9663	8287853	1	-12	50	-87	64	-18	1
6	6	4.9104	4308028	1	-12	50	-87	65	-20	2
6	6	5.3063	24307021	1	-12	50	-88	62	-15	1
6	6	5.2755	67241664	1	-12	50	-88	63	-16	1
6	6	5.2829	10918361	1	-12	50	-88	63	-17	1
6	6	5.2262	22616869	1	-12	50	-88	64	-15	1
6	6	5.2426	79195493	1	-12	50	-88	64	-17	1
6	6	5.1894	21787840	1	-12	50	-88	65	-16	1
6	6	5.2073	50353216	1	-12	50	-88	65	-18	1
6	6	5.1766	9521152	1	-12	50	-88	66	-20	2
6	6	5.1355	9596117	1	-12	50	-88	67	-21	2
6	6	5.3874	18899593	1	-12	50	-89	65	-15	1
6	6	5.3603	53580269	1	-12	50	-89	66	-16	1
6	6	5.3728	45273557	1	-12	50	-89	66	-18	1
6	6	5.3317	52021953	1	-12	50	-89	67	-17	1
6	6	5.3451	31097513	1	-12	50	-89	67	-19	1
6	6	5.3504	3072812	1	-12	50	-89	67	-20	2
6	6	5.3014	7454269	1	-12	50	-89	68	-18	1
6	6	5.4900	1868969	1	-12	50	-90	67	-15	1
6	6	5.4670	13783552	1	-12	50	-90	68	-16	1
6	6	5.4722	42232957	1	-12	50	-90	68	-17	1
6	6	5.4485	69238784	1	-12	50	-90	69	-18	1
6	6	5.4592	4170688	1	-12	50	-90	69	-20	1
6	6	5.4237	38299117	1	-12	50	-90	70	-19	1
6	6	5.4396	12003392	1	-12	50	-90	70	-22	2
6	6	5.3931	2495261	1	-12	50	-90	72	-25	3
6	6	5.5446	7764889	1	-12	50	-91	71	-18	1
6	6	5.5281	51619637	1	-12	50	-91	72	-20	1
6	6	5.5102	10885592	1	-12	50	-91	73	-22	2
6	6	5.6009	24277952	1	-12	50	-92	75	-22	1
6	6	5.5848	5163008	1	-12	50	-92	76	-24	2
6	6	5.6684	1134389	1	-12	50	-93	78	-24	1
6	6	4.7175	2323397	1	-12	51	-91	62	-15	1
6	6	4.4094	4125937	1	-12	51	-91	64	-16	1
6	6	4.8730	2990117	1	-12	51	-92	65	-15	1
6	6	4.8099	27971264	1	-12	51	-92	66	-16	1
6	6	4.6827	4305125	1	-12	51	-92	67	-15	1
6	6	4.7334	39113989	1	-12	51	-92	67	-17	1
6	6	4.7555	14572352	1	-12	51	-92	67	-18	1
6	6	4.5508	7649984	1	-12	51	-92	68	-16	1
6	6	4.6320	26608448	1	-12	51	-92	68	-18	1
6	6	4.4525	4224413	1	-12	51	-92	69	-19	1
6	6	4.9977	966125	1	-12	51	-93	68	-15	1
6	6	4.9494	30360953	1	-12	51	-93	69	-16	1
6	6	4.8791	14599577	1	-12	51	-93	70	-16	1
6	6	4.8945	53777189	1	-12	51	-93	70	-17	1
6	6	4.9234	44617157	1	-12	51	-93	70	-19	1
6	6	4.8305	50724209	1	-12	51	-93	71	-18	1
6	6	4.8650	33918033	1	-12	51	-93	71	-20	1
6	6	4.8778	7764889	1	-12	51	-93	71	-21	2
6	6	4.7516	27956333	1	-12	51	-93	72	-19	1
6	6	4.7956	4126869	1	-12	51	-93	72	-21	1
6	6	4.8112	15184532	1	-12	51	-93	72	-22	2

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tr-des	des	max.zero	poly. disc.	poly. coefficients						
6	6	4.6433	4588625	1	-12	51	-93	73	-20	1
6	6	5.1131	5689408	1	-12	51	-94	71	-16	1
6	6	5.0745	34521941	1	-12	51	-94	72	-17	1
6	6	5.0842	44183232	1	-12	51	-94	72	-18	1
6	6	5.0322	33681152	1	-12	51	-94	73	-18	1
6	6	5.0430	81955789	1	-12	51	-94	73	-19	1
6	6	5.0638	12410453	1	-12	51	-94	73	-21	1
6	6	4.9976	75262016	1	-12	51	-94	74	-20	1
6	6	5.0297	16196689	1	-12	51	-94	74	-23	2
6	6	4.9466	37077669	1	-12	51	-94	75	-21	1
6	6	4.9574	9186752	1	-12	51	-94	75	-22	2
6	6	4.9007	6856697	1	-12	51	-94	76	-23	2
6	6	4.9418	4170688	1	-12	51	-94	76	-26	3
6	6	5.2129	6550837	1	-12	51	-95	74	-17	1
6	6	5.1883	35362604	1	-12	51	-95	75	-19	1
6	6	5.1542	26426137	1	-12	51	-95	76	-20	1
6	6	5.1626	71377877	1	-12	51	-95	76	-21	1
6	6	5.1693	5030996	1	-12	51	-95	76	-22	2
6	6	5.1267	68663153	1	-12	51	-95	77	-22	1
6	6	5.0877	16470677	1	-12	51	-95	78	-23	1
6	6	5.0956	24252372	1	-12	51	-95	78	-24	2
6	6	5.1220	3549501	1	-12	51	-95	78	-27	3
6	6	5.2579	2540864	1	-12	51	-96	79	-22	1
6	6	5.2648	37173485	1	-12	51	-96	79	-23	1
6	6	5.2347	43373504	1	-12	51	-96	80	-24	1
6	6	5.2090	16626944	1	-12	51	-96	81	-26	2
6	6	5.2152	1397493	1	-12	51	-96	81	-27	3
6	6	5.3549	980125	1	-12	51	-97	82	-25	1
6	6	5.3289	15213449	1	-12	51	-97	83	-26	1
6	6	5.3120	8793749	1	-12	51	-97	84	-29	3
6	6	5.3982	2495261	1	-12	51	-98	87	-31	3
6	6	4.2872	3184733	1	-12	52	-97	72	-18	1
6	6	4.5251	9979841	1	-12	52	-98	75	-17	1
6	6	4.5554	5947904	1	-12	52	-98	75	-18	1
6	6	4.3091	2323397	1	-12	52	-98	76	-17	1
6	6	4.4312	20873565	1	-12	52	-98	76	-19	1
6	6	4.5083	4366125	1	-12	52	-98	76	-21	1
6	6	4.3577	6619648	1	-12	52	-98	77	-22	1
6	6	4.7282	10525997	1	-12	52	-99	78	-18	1
6	6	4.6525	21342577	1	-12	52	-99	79	-19	1
6	6	4.6747	34674577	1	-12	52	-99	79	-20	1
6	6	4.5545	2565429	1	-12	52	-99	80	-20	1
6	6	4.5851	34943060	1	-12	52	-99	80	-21	1
6	6	4.6125	47024373	1	-12	52	-99	80	-22	1
6	6	4.6321	7313969	1	-12	52	-99	80	-23	2
6	6	4.6602	592661	1	-12	52	-99	80	-24	1
6	6	4.4561	9944521	1	-12	52	-99	81	-22	1
6	6	4.4999	31137577	1	-12	52	-99	81	-23	1
6	6	4.5288	13431004	1	-12	52	-99	81	-24	2
6	6	4.2701	2235125	1	-12	52	-99	82	-24	1
6	6	4.5020	2782261	1	-12	52	-99	82	-28	3
6	6	4.8767	5279033	1	-12	52	-100	81	-19	1
6	6	4.8376	22272501	1	-12	52	-100	82	-21	1
6	6	4.7947	44358313	1	-12	52	-100	83	-23	1
6	6	4.8104	33846208	1	-12	52	-100	83	-24	1
6	6	4.8072	10338304	1	-12	52	-100	83	-24	2
6	6	4.7279	13875392	1	-12	52	-100	84	-24	1
6	6	4.7469	53269013	1	-12	52	-100	84	-25	1
6	6	4.7612	29838656	1	-12	52	-100	84	-26	2
6	6	4.6702	29156544	1	-12	52	-100	85	-26	1

tr-des	des	max.zero	poly. disc.	poly. coefficients				
6	6	4.7049	3706688	1 −12	52−100	85 −28	3	
6	6	4.5943	9816064	1 −12	52−100	86 −28	2	
6	6	4.6172	6554149	1 −12	52−100	86 −29	3	
6	6	4.9447	23619796	1 −12	52−101	86 −25	1	
6	6	4.9097	39319769	1 −12	52−101	87 −27	1	
6	6	4.9195	18743852	1 −12	52−101	87 −28	2	
6	6	4.8579	23772069	1 −12	52−101	88 −28	1	
6	6	4.8799	15185109	1 −12	52−101	88 −30	3	
6	6	4.8242	13322689	1 −12	52−101	89 −31	3	
6	6	4.7737	1868969	1 −12	52−101	90 −33	4	
6	6	5.0380	11767669	1 −12	52−102	90 −29	1	
6	6	4.9979	5431808	1 −12	52−102	91 −30	1	
6	6	5.0143	10814656	1 −12	52−102	91 −32	3	
6	6	4.9722	9011589	1 −12	52−102	92 −33	3	
6	6	5.0700	1202933	1 −12	52−103	96 −38	5	
6	6	4.1035	2286997	1 −12	53−104	85 −21	1	
6	6	3.9499	1075648	1 −12	53−104	86 −24	1	
6	6	4.4063	3477989	1 −12	53−105	88 −21	1	
6	6	4.3064	7070500	1 −12	53−105	89 −23	1	
6	6	4.1452	4418197	1 −12	53−105	90 −25	1	
6	6	4.2314	12224617	1 −12	53−105	90 −26	1	
6	6	4.2910	5398157	1 −12	53−105	90 −27	1	
6	6	4.1001	3319769	1 −12	53−105	91 −29	2	
6	6	4.5172	11473949	1 −12	53−106	93 −27	1	
6	6	4.4422	17831909	1 −12	53−106	94 −29	1	
6	6	4.4745	10998592	1 −12	53−106	94 −30	1	
6	6	4.4676	12150464	1 −12	53−106	94 −30	2	
6	6	4.3446	13294693	1 −12	53−106	95 −31	1	
6	6	4.3699	5689408	1 −12	53−106	95 −32	3	
6	6	4.4107	7905501	1 −12	53−106	95 −33	3	
6	6	4.2350	4170688	1 −12	53−106	96 −34	3	
6	6	4.2890	2661761	1 −12	53−106	96 −35	4	
6	6	4.6660	6139004	1 −12	53−107	97 −31	1	
6	6	4.6134	14505253	1 −12	53−107	98 −33	1	
6	6	4.6298	5758036	1 −12	53−107	98 −34	2	
6	6	4.5670	11329929	1 −12	53−107	99 −36	3	
6	6	4.5856	5611169	1 −12	53−107	99 −37	4	
6	6	4.4652	2501557	1 −12	53−107	100 −37	3	
6	6	4.5143	2812877	1 −12	53−107	100 −39	5	
6	6	4.7537	3706688	1 −12	53−108	102 −38	3	
6	6	4.7191	3477989	1 −12	53−108	103 −41	5	
6	6	4.0758	2323397	1 −12	54−112	104 −33	1	
6	6	3.9696	1259712	1 −12	54−112	105 −36	1	
6	6	4.2354	3486377	1 −12	54−113	109 −39	1	
6	6	4.1341	2565429	1 −12	54−113	110 −42	3	
6	6	4.1849	1868969	1 −12	54−113	110 −43	4	
6	6	4.3975	1202933	1 −12	54−114	114 −47	5	
6	6	4.3342	1081856	1 −12	54−114	115 −50	7	
6	7	5.4470	39829313	1 −13	61−131	136 −66	14	−1
6	7	5.5788	75602713	1 −13	61−132	138 −67	14	−1
6	7	5.6483	88537609	1 −13	61−133	142 −71	15	−1
6	7	4.7567	20134393	1 −13	62−135	140 −67	14	−1
6	7	5.0813	55311169	1 −13	62−136	142 −68	14	−1
6	7	4.9645	79044293	1 −13	62−136	144 −71	15	−1
6	7	5.1978	228132361	1 −13	62−137	146 −72	15	−1
6	7	5.1506	147049181	1 −13	62−137	147 −73	15	−1
6	7	5.1084	39829313	1 −13	62−137	148 −75	16	−1
6	7	5.3273	97212489	1 −13	62−138	149 −74	15	−1
6	7	5.2977	297916193	1 −13	62−138	150 −76	16	−1

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tr-des	des	max.zero	poly. disc.	poly. coefficients					
6	7	5.2662	25367689	1	-13	62-138	151	-78	17	-1
6	7	5.4119	160481173	1	-13	62-139	153	-78	16	-1
6	7	5.3860	41455873	1	-13	62-139	154	-80	17	-1
6	7	4.6623	63128113	1	-13	63-142	153	-75	15	-1
6	7	4.5407	107704601	1	-13	63-142	154	-77	16	-1
6	7	4.8327	100269173	1	-13	63-143	157	-78	16	-1
6	7	4.8535	261502945	1	-13	63-143	157	-79	16	-1
6	7	4.7659	175929793	1	-13	63-143	158	-80	16	-1
6	7	4.7862	339240017	1	-13	63-143	158	-81	17	-1
6	7	4.6750	93679973	1	-13	63-143	159	-82	17	-1
6	7	4.7024	75602713	1	-13	63-143	159	-83	18	-1
6	7	5.0256	79397476	1	-13	63-144	160	-80	16	-1
6	7	4.9948	338757233	1	-13	63-144	161	-83	17	-1
6	7	4.9461	384493129	1	-13	63-144	162	-85	18	-1
6	7	4.8906	69012929	1	-13	63-144	163	-87	19	-1
6	7	5.1109	238845553	1	-13	63-145	165	-87	18	-1
6	7	5.0819	100907057	1	-13	63-145	166	-90	20	-1
6	7	4.3501	75630121	1	-13	64-149	168	-86	17	-1
6	7	4.5832	118768997	1	-13	64-150	172	-89	18	-1
6	7	4.4801	134589773	1	-13	64-150	173	-91	18	-1
6	7	4.5158	307340809	1	-13	64-150	173	-92	19	-1
6	7	4.3616	100660489	1	-13	64-150	174	-94	20	-1
6	7	4.4175	91138133	1	-13	64-150	174	-95	21	-1
6	7	4.7712	69012929	1	-13	64-151	176	-93	18	-1
6	7	4.7232	234884549	1	-13	64-151	177	-96	20	-1
6	7	4.6688	174368473	1	-13	64-151	178	-99	22	-1
6	7	4.8481	20134393	1	-13	64-152	182	-104	24	-1
6	7	4.1760	58355513	1	-13	65-157	188	-102	20	-1
6	7	4.3399	55311169	1	-13	65-158	194	-113	26	-1