

> # Set the parameters and functions

c := 'c':

d := 'd':

u := 'u':

A4 := (9144 c - 39780) u⁸ + (86412 c² - 3048 d³ - 318240 d) u⁷ + (310452 c³ - 7620 d⁵ - 378 d⁴ - 1166040 d²) u⁶ + (6604 c⁷ + 26514 c⁵ + 669699 c⁴ - 19586 d⁶ - 2438730 d³) u⁵ + (9322 c⁸ + 914250 c⁵ - 508 d⁹ - 33226 d⁷ - 53151 d⁶ - 3050100 d⁴) u⁴ + (4318 c⁹ + 901644 c⁶ - 13049 d⁸ - 149022 d⁷ - 2080980 d⁵) u³ + (2286 c⁹ + 604962 c⁷ - 120033 d⁸ - 408240 d⁶) u² + (144477 c⁸ + 332910 c⁷ - 48006 d⁹) u + 159120 c⁸ - 36576 d⁹:

print(Output);

find Sturm's sequence

for j from 0 by 1 to 119 do

c := $\frac{404}{100} + \frac{j}{120} \cdot \left(\frac{4108}{1000} - \frac{404}{100} \right)$;

d := $\frac{404}{100} + \frac{j+1}{120} \cdot \left(\frac{4108}{1000} - \frac{404}{100} \right)$;

u := 'u':

S := sturmseq(A4, u);

signum := sturm(S, u, 0, $\frac{57}{10}$);

with(ArrayTools):

Slength := Size(S, 2);

X := Array(1.. Slength);

Y := Array(1.. Slength);

for i from 1 to Slength do

Find sgn $\left[s_{A_{4,i}}(0) \right]$

u := 0;

X[i] := signum(S[i]);

Find sgn $\left[s_{A_{4,i}}\left(\frac{57}{10}\right) \right]$

u := $\frac{57}{10}$;

Y[i] := signum(S[i]);

end do;

print(['a'[j], 'a'[j+1], sgn(s['A'[4,j]](0)), sgn(s['A'[4,j]]($\frac{57}{10}$))] = [evalf(c, 5), evalf(d, 5), X, Y]);

end do;

Output

$[a_0, a_1, \text{sgn}(s_{A_{4,0}}(0)), \text{sgn}(s_{A_{4,0}}(\frac{57}{10}))] = [4.0400, 4.0406, [1\ 1\ 1\ -1\ 1\ 1\ -1\ -1\ -1], [1\ -1\ -1\ 1\ 1\ 1\ 1\ -1\ -1]]$

$[a_1, a_2, \text{sgn}(s_{A_{4,1}}(0)), \text{sgn}(s_{A_{4,1}}(\frac{57}{10}))] = [4.0406, 4.0411, [1\ 1\ 1\ -1\ 1\ 1\ -1\ -1\ -1], [1\ -1\ -1\ 1\ 1\ 1\ 1\ -1\ -1]]$

$[a_2, a_3, \text{sgn}(s_{A_{4,2}}(0)), \text{sgn}(s_{A_{4,2}}(\frac{57}{10}))] = [4.0411, 4.0417, [1\ 1\ 1\ -1\ 1\ 1\ -1\ -1\ -1], [1\ -1\ -1\ 1\ 1\ 1\ 1\ -1\ -1]]$

$[a_3, a_4, \text{sgn}(s_{A_{4,3}}(0)), \text{sgn}(s_{A_{4,3}}(\frac{57}{10}))] = [4.0417, 4.0423, [1\ 1\ 1\ -1\ 1\ 1\ -1\ -1\ -1], [1\ -1\ -1\ 1\ 1\ 1\ 1\ -1\ -1]]$

$[a_4, a_5, \text{sgn}(s_{A_{4,4}}(0)), \text{sgn}(s_{A_{4,4}}(\frac{57}{10}))] = [4.0423, 4.0428, [1\ 1\ 1\ -1\ 1\ 1\ -1\ -1\ -1], [1\ -1\ -1\ 1\ 1\ 1\ 1\ -1\ -1]]$

$$\begin{aligned}
& \left[a_{101}, a_{102}, \operatorname{sgn}(s_{A_{4,101}}(0)), \operatorname{sgn}(s_{A_{4,101}}(5.7)) \right] = [4.0972, 4.0978, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{102}, a_{103}, \operatorname{sgn}(s_{A_{4,102}}(0)), \operatorname{sgn}(s_{A_{4,102}}(5.7)) \right] = [4.0978, 4.0984, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{103}, a_{104}, \operatorname{sgn}(s_{A_{4,103}}(0)), \operatorname{sgn}(s_{A_{4,103}}(5.7)) \right] = [4.0984, 4.0989, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{104}, a_{105}, \operatorname{sgn}(s_{A_{4,104}}(0)), \operatorname{sgn}(s_{A_{4,104}}(5.7)) \right] = [4.0989, 4.0995, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{105}, a_{106}, \operatorname{sgn}(s_{A_{4,105}}(0)), \operatorname{sgn}(s_{A_{4,105}}(5.7)) \right] = [4.0995, 4.1001, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{106}, a_{107}, \operatorname{sgn}(s_{A_{4,106}}(0)), \operatorname{sgn}(s_{A_{4,106}}(5.7)) \right] = [4.1001, 4.1006, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{107}, a_{108}, \operatorname{sgn}(s_{A_{4,107}}(0)), \operatorname{sgn}(s_{A_{4,107}}(5.7)) \right] = [4.1006, 4.1012, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{108}, a_{109}, \operatorname{sgn}(s_{A_{4,108}}(0)), \operatorname{sgn}(s_{A_{4,108}}(5.7)) \right] = [4.1012, 4.1018, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{109}, a_{110}, \operatorname{sgn}(s_{A_{4,109}}(0)), \operatorname{sgn}(s_{A_{4,109}}(5.7)) \right] = [4.1018, 4.1023, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{110}, a_{111}, \operatorname{sgn}(s_{A_{4,110}}(0)), \operatorname{sgn}(s_{A_{4,110}}(5.7)) \right] = [4.1023, 4.1029, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{111}, a_{112}, \operatorname{sgn}(s_{A_{4,111}}(0)), \operatorname{sgn}(s_{A_{4,111}}(5.7)) \right] = [4.1029, 4.1035, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{112}, a_{113}, \operatorname{sgn}(s_{A_{4,112}}(0)), \operatorname{sgn}(s_{A_{4,112}}(5.7)) \right] = [4.1035, 4.1040, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{113}, a_{114}, \operatorname{sgn}(s_{A_{4,113}}(0)), \operatorname{sgn}(s_{A_{4,113}}(5.7)) \right] = [4.1040, 4.1046, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{114}, a_{115}, \operatorname{sgn}(s_{A_{4,114}}(0)), \operatorname{sgn}(s_{A_{4,114}}(5.7)) \right] = [4.1046, 4.1052, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{115}, a_{116}, \operatorname{sgn}(s_{A_{4,115}}(0)), \operatorname{sgn}(s_{A_{4,115}}(5.7)) \right] = [4.1052, 4.1057, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{116}, a_{117}, \operatorname{sgn}(s_{A_{4,116}}(0)), \operatorname{sgn}(s_{A_{4,116}}(5.7)) \right] = [4.1057, 4.1063, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{117}, a_{118}, \operatorname{sgn}(s_{A_{4,117}}(0)), \operatorname{sgn}(s_{A_{4,117}}(5.7)) \right] = [4.1063, 4.1069, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{118}, a_{119}, \operatorname{sgn}(s_{A_{4,118}}(0)), \operatorname{sgn}(s_{A_{4,118}}(5.7)) \right] = [4.1069, 4.1074, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]] \\
& \left[a_{119}, a_{120}, \operatorname{sgn}(s_{A_{4,119}}(0)), \operatorname{sgn}(s_{A_{4,119}}(5.7)) \right] = [4.1074, 4.1080, [1\ 1\ 1\ -1\ 1\ -1\ -1\ -1\ -1], [1\ 1\ -1\ -1\ 1\ 1\ -1\ -1\ -1]]
\end{aligned}$$

(1)

