

> # Set the parameters and functions

c := 'c':

d := 'd':

u := 'u':

$$E3 := (9360000 c - 40478400) u^7 + (123624000 c^2 + 79477167 - 15600000 d^3 - 312878520 d) u^6$$

$$+ (12480000 c^5 + 418993800 c^3 + 476863002 c - 91411200 d^4 - 860506665 d^2) u^5$$

$$+ (23217600 c^6 + 621308436 c^4 + 1192157505 c^2 - 1040000 d^7 - 199260960 d^5$$

$$- 1100550468 d^3) u^4 + (14018680 c^7 + 486042654 c^5 + 1589543340 c^3 - 155887303 d^6$$

$$- 663541512 d^4) u^3 + (155487978 c^6 + 1192157505 c^4 - 43552080 d^7 - 215944200 d^5) u^2$$

$$+ (476863002 c^5 - 13976040 d^7 - 134854731 d^6) u + 79477167 c^6 - 70008120 d^7 :$$

print(Output);

# find Sturm's sequence` `

for j from 0 by 1 to 179 do

$$c := \frac{402}{100} + \frac{j+1}{180} \cdot \left( \frac{403}{100} - \frac{402}{100} \right) :$$

$$d := \frac{402}{100} + \frac{j}{180} \cdot \left( \frac{403}{100} - \frac{402}{100} \right) :$$

u := 'u':

S := sturmseq(E3, u);

signnum := sturm(S, u, 4,  $\frac{538}{100}$ );

with(ArrayTools) :

Slength := Size(S, 2);

X := Array(1 .. Slength);

Y := Array(1 .. Slength);

for i from 1 to Slength do

# Find sgn  $\left[ s_{E_{3,i}}(4) \right]$

u := 4;

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

# Find sgn  $\left[ s_{E_{3,i}}(5.38) \right]$

u :=  $\frac{538}{100}$  :

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

end do;

# show the final results

print([ 'a'[280 + j], 'a'[281 + j], sgn(s['E'[3, 280 + j])(4)), sgn(s['E'[3, 280 + j])(5.38)) ]  
= [evalf(d, 5), evalf(c, 5), X, Y] );

end do:

### Output

$$\left[ a_{280}, a_{281}, \text{sgn}\left(s_{E_{3,280}}(4)\right), \text{sgn}\left(s_{E_{3,280}}(5.38)\right) \right] = [4.0200, 4.0201, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]]$$

$$\left[ a_{281}, a_{282}, \text{sgn}\left(s_{E_{3,281}}(4)\right), \text{sgn}\left(s_{E_{3,281}}(5.38)\right) \right] = [4.0201, 4.0201, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]]$$

$$\left[ a_{282}, a_{283}, \text{sgn}\left(s_{E_{3,282}}(4)\right), \text{sgn}\left(s_{E_{3,282}}(5.38)\right) \right] = [4.0201, 4.0202, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]]$$

$$\left[ a_{283}, a_{284}, \text{sgn}\left(s_{E_{3,283}}(4)\right), \text{sgn}\left(s_{E_{3,283}}(5.38)\right) \right] = [4.0202, 4.0202, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]]$$











$$\begin{aligned}
& [a_{444}, a_{445}, \operatorname{sgn}(s_{E_{3,444}}(4)), \operatorname{sgn}(s_{E_{3,444}}(5.38))] = [4.0291, 4.0292, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{445}, a_{446}, \operatorname{sgn}(s_{E_{3,445}}(4)), \operatorname{sgn}(s_{E_{3,445}}(5.38))] = [4.0292, 4.0292, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{446}, a_{447}, \operatorname{sgn}(s_{E_{3,446}}(4)), \operatorname{sgn}(s_{E_{3,446}}(5.38))] = [4.0292, 4.0293, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{447}, a_{448}, \operatorname{sgn}(s_{E_{3,447}}(4)), \operatorname{sgn}(s_{E_{3,447}}(5.38))] = [4.0293, 4.0293, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{448}, a_{449}, \operatorname{sgn}(s_{E_{3,448}}(4)), \operatorname{sgn}(s_{E_{3,448}}(5.38))] = [4.0293, 4.0294, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{449}, a_{450}, \operatorname{sgn}(s_{E_{3,449}}(4)), \operatorname{sgn}(s_{E_{3,449}}(5.38))] = [4.0294, 4.0294, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{450}, a_{451}, \operatorname{sgn}(s_{E_{3,450}}(4)), \operatorname{sgn}(s_{E_{3,450}}(5.38))] = [4.0294, 4.0295, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{451}, a_{452}, \operatorname{sgn}(s_{E_{3,451}}(4)), \operatorname{sgn}(s_{E_{3,451}}(5.38))] = [4.0295, 4.0296, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{452}, a_{453}, \operatorname{sgn}(s_{E_{3,452}}(4)), \operatorname{sgn}(s_{E_{3,452}}(5.38))] = [4.0296, 4.0296, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{453}, a_{454}, \operatorname{sgn}(s_{E_{3,453}}(4)), \operatorname{sgn}(s_{E_{3,453}}(5.38))] = [4.0296, 4.0297, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{454}, a_{455}, \operatorname{sgn}(s_{E_{3,454}}(4)), \operatorname{sgn}(s_{E_{3,454}}(5.38))] = [4.0297, 4.0297, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{455}, a_{456}, \operatorname{sgn}(s_{E_{3,455}}(4)), \operatorname{sgn}(s_{E_{3,455}}(5.38))] = [4.0297, 4.0298, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{456}, a_{457}, \operatorname{sgn}(s_{E_{3,456}}(4)), \operatorname{sgn}(s_{E_{3,456}}(5.38))] = [4.0298, 4.0298, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{457}, a_{458}, \operatorname{sgn}(s_{E_{3,457}}(4)), \operatorname{sgn}(s_{E_{3,457}}(5.38))] = [4.0298, 4.0299, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{458}, a_{459}, \operatorname{sgn}(s_{E_{3,458}}(4)), \operatorname{sgn}(s_{E_{3,458}}(5.38))] = [4.0299, 4.0299, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]] \\
& [a_{459}, a_{460}, \operatorname{sgn}(s_{E_{3,459}}(4)), \operatorname{sgn}(s_{E_{3,459}}(5.38))] = [4.0299, 4.0300, [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1], [-1 \ 1 \ 1 \ 1 \ -1 \ -1 \ 1 \ -1]]
\end{aligned}$$

(1)

