Inequalities - JNCF 26

Demo Part I

> **restart**

▼ AMM 11501

The goal is to show that the Taylor coefficient of the following rational function are nonnegative for $a \geq \mathrm{sqrt}(3)$:

> **g:=1–3/(1/(1–a∗z)+1/(1–I∗z)+1/(1+I∗z));**

$$g := 1 - \cfrac{3}{\cfrac{1}{-az+1} + \cfrac{1}{1-Iz} + \cfrac{1}{1+Iz}} \qquad (1.1)$$

Necessary condition:

> **map(expand,series(g,z,4));**

$$\frac{a}{3}\,z + \left(\frac{2\,a^2}{9} - \frac{2}{3}\right)z^2 + \left(\frac{4}{27}\,a^3 + \frac{4}{9}\,a\right)z^3 + \mathrm{O}(z^4) \qquad (1.2)$$

The first coefficient forces $a \geq 0$ and the second one forces $a^2 \geq 3$.

Linear recurrence:

> **gfun:–diffeqtorec(gfun:–holexprtodiffeq(g,y(z)),y(z),u(n));**

$$\left\{ -u(n) + 2\,a\,u(n+1) - 3\,u(n+2),\; u(0) = 0,\; u(1) = \frac{a}{3},\; u(2) = \frac{2\,a^2}{9} - \frac{2}{3},\; u(3) \right. \qquad (1.3)$$

$$\left. = \frac{4}{27}\,a^3 + \frac{4}{9}\,a \right\}$$

There are 4 initial conditions for this recurrence of order 2 meaning that the recurrence applies only for $n \geq 2$.

> **gfun:–ratpolytocoeff(g,z,n);**

$$\sum_{\_\alpha = RootOf(\_Z^2 - 2\,\_Z a + 3)} \left(-\frac{(-6\,\_\alpha\,a^3 + 6\,\_\alpha\,a + 9\,a^2 - 3)\,\_\alpha^{-n}}{(a - \_\alpha)\,\_\alpha} \right) \qquad (1.4)$$

$$+ \left(\left\{ \begin{array}{ll} 3\,a & n = 1 \\ 6\,a^2 - 2 & n = 0 \\ 0 & otherwise \end{array} \right. \right)$$

> **co0:=allvalues(%) assuming n>=2;**

$co0 :=$ $\qquad (1.5)$

$$\frac{\left(-6\left(a + \sqrt{a^2 - 3}\right)a^3 + 6\left(a + \sqrt{a^2 - 3}\right)a + 9\,a^2 - 3\right)\left(a + \sqrt{a^2 - 3}\right)^{-n}}{\sqrt{a^2 - 3}\left(a + \sqrt{a^2 - 3}\right)}$$

$$-\frac{\left(-6\left(a-\sqrt{a^2-3}\right)a^3+6\left(a-\sqrt{a^2-3}\right)a+9\,a^2-3\right)\left(a-\sqrt{a^2-3}\right)^{-n}}{\sqrt{a^2-3}\left(a-\sqrt{a^2-3}\right)}$$

We analyse the signs of the coefficients of these nth powers

```
> co:=subs([(a - sqrt(a^2 - 3))^(-n)=X[1],(a + sqrt(a^2 - 3))^(-
  n)=X[0]],%);
```

$$co := \frac{\left(-6\left(a+\sqrt{a^2-3}\right)a^3+6\left(a+\sqrt{a^2-3}\right)a+9\,a^2-3\right)X_0}{\sqrt{a^2-3}\left(a+\sqrt{a^2-3}\right)}$$

$$-\frac{\left(-6\left(a-\sqrt{a^2-3}\right)a^3+6\left(a-\sqrt{a^2-3}\right)a+9\,a^2-3\right)X_1}{\sqrt{a^2-3}\left(a-\sqrt{a^2-3}\right)}$$

(1.6)

```
> collect(co,[X[0],X[1]],normal@evala@Expand);
```

$$-\frac{\left(3\,a^2\sqrt{a^2-3}+3\,a^3-\sqrt{a^2-3}-5\,a\right)X_0}{\sqrt{a^2-3}}$$

(1.7)

$$-\frac{\left(3\,a^2\sqrt{a^2-3}-3\,a^3-\sqrt{a^2-3}+5\,a\right)X_1}{\sqrt{a^2-3}}$$

```
> signum(coeff(%,X[1])) assuming a>sqrt(3);
```

$$1$$

(1.8)

The sign in front of the fastest growing term is positive, which shows ultimate positivity.
It is thus sufficient to prove the positivity for n=2.

```
> eval(co0,n=2);
```

$$\frac{-6\left(a+\sqrt{a^2-3}\right)a^3+6\left(a+\sqrt{a^2-3}\right)a+9\,a^2-3}{\left(a+\sqrt{a^2-3}\right)^3\sqrt{a^2-3}}$$

(1.9)

$$-\frac{-6\left(a-\sqrt{a^2-3}\right)a^3+6\left(a-\sqrt{a^2-3}\right)a+9\,a^2-3}{\left(a-\sqrt{a^2-3}\right)^3\sqrt{a^2-3}}$$

```
> evala(Normal(%));
```

$$\frac{2\,a^2}{9}-\frac{2}{3}$$

(1.10)

This is nonnegative for a ≥ sqrt(3), concluding the proof.

Gerhold-Kauers Method

Start with a basic example of quantifier elimination:

```
> QuantifierElimination[QuantifierEliminate](exists(x,a*x^2+b*x+
  c=0));
```

$$(a=0 \wedge b=0 \wedge c=0) \vee (a=0 \wedge b \neq 0 \wedge a\,c^2=0) \vee (a<0 \wedge 4\,a\,c-b^2<0)$$
$$\vee \left(a \neq 0 \wedge 4\,a\,c-b^2 \leq 0\right) \vee \left(-a<0 \wedge 4\,a\,c-b^2<0\right)$$

(2.1)

Turan's inequality

Turan's inequality:

```
> P[n](x)^2-P[n+1](x)*P[n-1](x)>=0;
```

$$0 \leq P_n(x)^2 - P_{n+1}(x)\, P_{n-1}(x) \tag{2.1.1}$$

where P_n are the Legendre polynomials

The Legendre polynomials are defined by their recurrence:

```
> eqL:=(n + 1)*p(n) - (2*n + 3)*x*p(n + 1) + (n + 2)*p(n + 2)=
  0;
```

$$eqL := (n+1)\, p(n) - (2n+3)\, x\, p(n+1) + (n+2)\, p(n+2) = 0 \tag{2.1.2}$$

```
> Turan:=p(n)^2-p(n+1)*p(n-1);
```

$$Turan := p(n)^2 - p(n+1)\, p(n-1) \tag{2.1.3}$$

First test: does the inequality hold for arbitrary values of p(n) and p(n-1):

```
> m:=0:
```

A formula whose unsatisfiability would prove Turan's inequality

```
> And(-1<x,x<1,n>=1,seq(subs(n=n+i,eqL),i=0..m),seq(subs(n=n+
  i,Turan)>0,i=1..m),subs(n=n+m+1,Turan)<0);
```

$$-1 < x \wedge x < 1 \wedge 1 \leq n \wedge (n+1)\, p(n) - (2n+3)\, x\, p(n+1) + (n+2)\, p(n \tag{2.1.4}$$
$$+2) = 0 \wedge p(n+1)^2 - p(n+2)\, p(n) < 0$$

Forget the relation between the p(n+i):

```
> ineqs:=subs(seq(p(n+i)=p[i],i=0..m+2),%);
```

$$ineqs := -1 < x \wedge x < 1 \wedge 1 \leq n \wedge (n+1)\, p_0 - (2n+3)\, x\, p_1 + (n+2)\, p_2 \tag{2.1.5}$$
$$= 0 \wedge -p_2\, p_0 + p_1^2 < 0$$

```
> formula:=exists([x,n,seq(p[i],i=0..m+2)],ineqs);
```

$$formula := \exists\left([x, n, p_0, p_1, p_2], -1 < x \wedge x < 1 \wedge 1 \leq n \wedge (n+1)\, p_0 - (2n \tag{2.1.6} \right.$$
$$\left. +3)\, x\, p_1 + (n+2)\, p_2 = 0 \wedge -p_2\, p_0 + p_1^2 < 0\right)$$

```
> st:=time():QuantifierElimination[QuantifierEliminate]
  (formula),time()-st;
```

$$true, 4.579 \tag{2.1.7}$$

Faster code:

```
> SMTLIB[Satisfiable]({ineqs});
```

$$true \tag{2.1.8}$$

This means that there are values of p_n(x) and p_{n+1}(x) for which positivity does not hold.
Next, look at the induction Turan(n) ==> Turan(n+1):

```
> m:=1:
> And(-1<x,x<1,n>=1,seq(subs(n=n+i,eqL),i=0..m),seq(subs(n=n+
  i,Turan)>0,i=1..m),subs(n=n+m+1,Turan)<0);
```

$$-1 < x \wedge x < 1 \wedge 1 \leq n \wedge (n+1)\, p(n) - (2n+3)\, x\, p(n+1) + (n+2)\, p(n \tag{2.1.9}$$
$$+2) = 0 \wedge (n+2)\, p(n+1) - (2n+5)\, x\, p(n+2) + (n+3)\, p(n+3) = 0$$
$$\wedge 0 < p(n+1)^2 - p(n+2)\, p(n) \wedge p(n+2)^2 - p(n+3)\, p(n+1) < 0$$

```
> subs(seq(p(n+i)=p[i],i=0..m+2),%);
```

$$-1 < x \wedge x < 1 \wedge 1 \leq n \wedge (n+1)\, p_0 - (2n+3)\, x\, p_1 + (n+2)\, p_2 = 0 \wedge (n \tag{2.1.10}$$
$$+2)\, p_1 - (2n+5)\, x\, p_2 + (n+3)\, p_3 = 0 \wedge 0 < -p_0\, p_2 + p_1^2 \wedge -p_3\, p_1 + p_2^2$$
$$< 0$$

killed after 1 min.
```
> #QuantifierElimination[QuantifierEliminate](exists([x,n,seq
  (p[i],i=0..m+2)],%));
> SMTLIB[Satisfiable]({%});
```
$$false \tag{2.1.11}$$

This shows that the induction holds.

The proof of the inequality is then completed by finding a value of $n \geq 2$ where it holds

```
> expand([seq(orthopoly[P](n,x)^2-orthopoly[P](n+1,x)*
  orthopoly[P](n-1,x),n=1..5)]);
```
$$\left[-\frac{x^2}{2} + \frac{1}{2}, \frac{1}{4} - \frac{x^4}{4}, -\frac{5}{16} x^6 + \frac{5}{16} x^4 - \frac{3}{16} x^2 + \frac{3}{16}, \frac{9}{64} - \frac{15}{32} x^4 \right. \tag{2.1.12}$$
$$-\frac{35}{64} x^8 + \frac{7}{8} x^6, -\frac{147}{128} x^{10} + \frac{315}{128} x^8 - \frac{119}{64} x^6 + \frac{35}{64} x^4 - \frac{15}{128} x^2$$
$$\left. +\frac{15}{128} \right]$$

```
> map(signum,%) assuming x>-1,x<1;
```
$$[1, 1, 1, 1, 1] \tag{2.1.13}$$

An example where it does not terminate

```
> rec:={u(n+2)-3*u(n+1)+2*u(n),u(0)=1,u(1)=3};
```
$$rec := \{u(n+2) - 3\,u(n+1) + 2\,u(n), u(0) = 1, u(1) = 3\} \tag{2.2.1}$$

```
> gfun:-rectoproc(rec,u(n),list)(20);
```
$$[1, 3, 7, 15, 31, 63, 127, 255, 511, 1023, 2047, 4095, 8191, 16383, 32767, 65535, \tag{2.2.2}$$
$$131071, 262143, 524287, 1048575, 2097151]$$

```
> formula:=proc(m) local i;{seq(s[i]>0,i=0..m-1),seq(s[i+2]-3*
  s[i+1]+2*s[i]=0,i=0..m-2),s[m]<0} end:
> formula(4);
```
$$\{s_2 - 3\,s_1 + 2\,s_0 = 0, s_3 - 3\,s_2 + 2\,s_1 = 0, s_4 - 3\,s_3 + 2\,s_2 = 0, 0 < s_0, 0 < s_1, 0 \tag{2.2.3}$$
$$< s_2, 0 < s_3, s_4 < 0\}$$

```
> for i to 30 do i,SMTLIB[Satisfiable](formula(i)) od;
```
$$1, true$$
$$2, true$$
$$3, true$$
$$4, true$$
$$5, true$$
$$6, true$$
$$7, true$$
$$8, true$$
$$9, true$$
$$10, true$$
$$11, true$$
$$12, true$$

$$13, \textit{true}$$
$$14, \textit{true}$$
$$15, \textit{true}$$
$$16, \textit{true}$$
$$17, \textit{true}$$
$$18, \textit{true}$$
$$19, \textit{true}$$
$$20, \textit{true}$$
$$21, \textit{true}$$
$$22, \textit{true}$$
$$23, \textit{true}$$
$$24, \textit{true}$$
$$25, \textit{true}$$
$$26, \textit{true}$$
$$27, \textit{true}$$
$$28, \textit{true}$$
$$29, \textit{true}$$
$$30, \textit{true} \tag{2.2.4}$$

Explanation

```
> rsolve({op(1,rec),u(0)=s[0],u(1)=s[1]},u(n));
```
$$-\left(s_0 - s_1\right) 2^n + 2\, s_0 - s_1 \tag{2.2.1.1}$$

```
> isolate(%,s[1]);
```
$$s_1 = \frac{-2\, s_0 + 2^n\, s_0}{2^n - 1} \tag{2.2.1.2}$$

```
> factor(%);
```
$$s_1 = \frac{s_0\left(2^n - 2\right)}{2^n - 1} \tag{2.2.1.3}$$

```
> normal(1-1/(2^n-1));
```
$$\frac{2^n - 2}{2^n - 1} \tag{2.2.1.4}$$

Each step of GK will produce the constraint s[1]>(1-1/(2^n-1))s[0], which is stricter than the previous one.

Kauers-Pillwein

Fix the previous example

Add a constraint u(n+1)>(3/2)*u(n)

```
> formula(3) union {s[2]>3/2*s[1]};
```

$$\tag{3.1.1}$$

$$\left\{ s_2 - 3\,s_1 + 2\,s_0 = 0, s_3 - 3\,s_2 + 2\,s_1 = 0, 0 < s_0, 0 < s_1, 0 < s_2, s_3 < 0, \frac{3\,s_1}{2} \right.$$

(3.1.1)

$$\left. < s_2 \right\}$$

```
> SMTLIB[Satisfiable](%);
```

$$false$$

(3.1.2)

Check initial conditions:

```
> pp:=gfun:-rectoproc(rec,u(n)):
> seq(pp(i),i=0..2);
```

$$1, 3, 7$$

(3.1.3)

```
> pp(2)-3/2*pp(1);
```

$$\frac{5}{2}$$

(3.1.4)

Proof of positivity complete.

An example with polynomial coefficients

```
> rec:={(n+3)*f(n+3)-(5*n+13)*f(n+2)+(5*n+12)*f(n+1)-(n+2)*f
  (n),f(0)=1,f(1)=1/4,f(2)=1/10};
```

$$rec := \left\{ (n+3)\,f(n+3) - (5\,n+13)\,f(n+2) + (5\,n+12)\,f(n+1) - (n \right.$$

(3.2.1)

$$\left. + 2)\,f(n), f(0) = 1, f(1) = \frac{1}{4}, f(2) = \frac{1}{10} \right\}$$

```
> L:=gfun:-rectoproc(rec,f(n),list)(100):
> evalf([seq(L[i+1]/L[i],i=1..nops(L)-1)]);
```

[0.2500000000, 0.4000000000, 1., 2.125000000, 2.905882353, 3.253036437,

(3.2.2)

    3.399679972, 3.468696886, 3.507789568, 3.534092658, 3.553894293,

    3.569755577, 3.582903763, 3.594035408, 3.603600742, 3.611915803,

    3.619213659, 3.625671635, 3.631427618, 3.636590657, 3.641248209,

    3.645471269, 3.649318089, 3.652836921, 3.656068088, 3.659045545,

    3.661798098, 3.664350340, 3.666723402, 3.668935538, 3.671002600,

    3.672938423, 3.674755133, 3.676463406, 3.678072680, 3.679591324,

    3.681026792, 3.682385739, 3.683674130, 3.684897324, 3.686060150,

    3.687166974, 3.688221748, 3.689228060, 3.690189178, 3.691108080,

    3.691987490, 3.692829901, 3.693637601, 3.694412692, 3.695157112,

    3.695872646, 3.696560944, 3.697223532, 3.697861826, 3.698477137,

    3.699070685, 3.699643605, 3.700196955, 3.700731721, 3.701248823,

    3.701749123, 3.702233427, 3.702702489, 3.703157020, 3.703597683,

    3.704025104, 3.704439871, 3.704842539, 3.705233628, 3.705613631,

    3.705983014, 3.706342215, 3.706691650, 3.707031712, 3.707362772,

    3.707685184, 3.707999283, 3.708305385, 3.708603793, 3.708894792,

    3.709178656, 3.709455644, 3.709726002, 3.709989967, 3.710247761,

    3.710499599, 3.710745685, 3.710986214, 3.711221372, 3.711451338,

3.711676280, 3.71896362, 3.712111740, 3.712322563, 3.712528973,
3.712731109, 3.712929102, 3.713123077, 3.713313156]

These numerical values show that we can try to prove an induction with $u(n+1) \geq 2u(n)$

```
> eq:=isolate(op(1,rec),f(n+3));
```

$$eq := f(n+3) = \frac{(5n+13)f(n+2) - (5n+12)f(n+1) + (n+2)f(n)}{n+3}$$ (3.2.3)

```
> mu:=2;
```

$$\mu := 2$$ (3.2.4)

```
> X[3]:=subs(seq(f(n+i)=X[i],i=0..2),op(2,eq));
```

$$X_3 := \frac{(5n+13)X_2 - (5n+12)X_1 + (n+2)X_0}{n+3}$$ (3.2.5)

```
> ineq:=X[3]<mu*X[2];
```

$$ineq := \frac{(5n+13)X_2 - (5n+12)X_1 + (n+2)X_0}{n+3} < 2X_2$$ (3.2.6)

```
> formula:={n>=0,X[0]>0,seq(X[i+1]>mu*X[i],i=0..1),ineq};
```

$$formula := \left\{ 0 \leq n, 0 < X_0, \frac{(5n+13)X_2 - (5n+12)X_1 + (n+2)X_0}{n+3} \right.$$ (3.2.7)

$$\left. < 2X_2, 2X_0 < X_1, 2X_1 < X_2 \right\}$$

```
> SMTLIB[Satisfiable](formula);
```

$$false$$ (3.2.8)

Proof of the induction complete! (Again, initial conditions have to be checked.)
One can also find mu by quantifier elimination:

```
> mu:='mu':
> formula:=forall([X[0],X[1],X[2],n],Implies(And(n>=0,X[0]>0,
  seq(X[i+1]>mu*X[i],i=0..1)),subs(f(n+2)=X[2],f(n+1)=X[1],f(n)
  =X[0],subs(eq,f(n+3)>mu*f(n+2)))));
```

$$formula := \forall \left([X_0, X_1, X_2, n], 0 \leq n \wedge 0 < X_0 \wedge \mu X_0 < X_1 \wedge \mu X_1 < X_2 \Rightarrow \mu X_2 \right.$$ (3.2.9)

$$\left. < \frac{(5n+13)X_2 - (5n+12)X_1 + (n+2)X_0}{n+3} \right)$$

```
> elim:=QuantifierElimination[QuantifierEliminate](formula);
```

$$elim := \left(3\mu \leq 13 \vee \left(-9\mu^4 + 78\mu^3 - 205\mu^2 + 162\mu \leq 26 \wedge \left(9\mu^4 - 78\mu^3 \right. \right. \right.$$ (3.2.10)

$$\left. + 205\mu^2 - 162\mu + 26 \neq 0 \vee -9\mu^3 + 78\mu^2 - 205\mu \leq -156 \right) \right) \wedge \left(\mu^2 \right.$$

$$- 4\mu + 1 = 0 \vee \mu^3 - 5\mu^2 + 5\mu \leq 1 \vee -3\mu^4 + 22\mu^3 - 45\mu^2 + 18\mu < 2$$

$$\vee \mu^2 - 3\mu \leq -2 \right) \wedge \left(\left(3\mu \leq 13 \wedge \left(3\mu - 13 \neq 0 \vee \mu \leq 5 \right) \right) \vee \left(-9\mu^4 \right. \right.$$

$$+ 78\mu^3 - 205\mu^2 + 162\mu \leq 26 \wedge \left(9\mu^4 - 78\mu^3 + 205\mu^2 - 162\mu + 26 \neq 0 \right.$$

$$\vee \left(-6\mu^4 + 56\mu^3 - 157\mu^2 + 130\mu \leq 23 \wedge \left(6\mu^4 - 56\mu^3 + 157\mu^2 \right. \right.$$

$$- 130\mu + 23 \neq 0 \vee -\mu^4 + 10\mu^3 - 30\mu^2 + 26\mu \leq 5 \right) \right) \right) \wedge \left(\mu^4 - 10\mu^3 \right.$$

$$+ 30\mu^2 - 26\mu + 5 \neq 0 \vee 6\mu^4 - 56\mu^3 + 157\mu^2 - 130\mu + 23 \neq 0 \vee 9\mu^4$$

$$-78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \neq 0 \vee \left(-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \leq -156\right.$$
$$\wedge \left(9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \vee \left(-6\,\mu^3 + 56\,\mu^2 - 157\,\mu \leq -125\right.\right.$$
$$\wedge \left(6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \neq 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25\right)\big)\big)\big)\big)\big)$$
$$\big) \wedge \left(\mu - 5 = 0 \vee \mu \leq 5 \vee \left(-3\,\mu^2 + 28\,\mu \leq 65 \wedge 3\,\mu^2 - 28\,\mu + 65 \neq 0\right)\right.$$
$$\vee \left(\mu^2 - 2\,\mu \leq -1 \wedge \left(\mu^2 - 2\,\mu + 1 \neq 0 \vee -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu\right.\right.$$
$$\leq 5\big) \wedge \left(\mu^4 - 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5 \neq 0 \vee 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2\right.$$
$$- 130\,\mu + 23 \neq 0 \vee 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \neq 0 \vee \left(3\,\mu \leq 5\right.$$
$$\wedge \left(-5 + 3\,\mu \neq 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25\right)\big)\big)\big)\big) \wedge \left(\mu^2 - 4\,\mu + 1\right.$$
$$= 0 \vee \left(\mu^3 - 5\,\mu^2 + 5\,\mu \leq 1 \wedge \left(\mu^3 - 5\,\mu^2 + 5\,\mu - 1 \neq 0 \vee \mu \leq 5\right)\right) \vee \big($$
$$-3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu \leq 2 \wedge 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2 - 18\,\mu + 2 \neq 0\big)$$
$$\vee \left(-\mu^2 + 2\,\mu \leq 1 \wedge \left(\mu^2 - 2\,\mu + 1 \neq 0 \vee -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu\right.\right.$$
$$\leq 5\big) \wedge \left(\mu^4 - 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5 \neq 0 \vee 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2\right.$$
$$- 130\,\mu + 23 \neq 0 \vee 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \neq 0 \vee \left(\mu^2 - 3\,\mu\right.$$
$$\leq -2 \wedge \left(\mu^2 - 3\,\mu + 2 \neq 0 \vee \left(-3\,\mu^5 + 31\,\mu^4 - 116\,\mu^3 + 192\,\mu^2 - 137\,\mu\right.\right.$$
$$\leq -25 \wedge \left(3\,\mu^5 - 31\,\mu^4 + 116\,\mu^3 - 192\,\mu^2 + 137\,\mu - 25 \neq 0 \vee -\mu^3\right.$$
$$+ 10\,\mu^2 - 30\,\mu \leq -25\big)\big)\big)\big)\big)\big)\big) \wedge \left(\mu^2 - 5\,\mu + 5 = 0 \vee \left(3\,\mu^3 - 20\,\mu^2\right.\right.$$
$$+ 40\,\mu \leq 25 \wedge \left(3\,\mu^3 - 20\,\mu^2 + 40\,\mu - 25 \neq 0 \vee \mu \leq 5\right)\right) \vee \left(-3\,\mu^4\right.$$
$$+ 28\,\mu^3 - 92\,\mu^2 + 125\,\mu \leq 60 \wedge 3\,\mu^4 - 28\,\mu^3 + 92\,\mu^2 - 125\,\mu + 60 \neq 0\big)$$
$$\vee \left(-3\,\mu^3 + 14\,\mu^2 - 21\,\mu \leq -10 \wedge \left(3\,\mu^3 - 14\,\mu^2 + 21\,\mu - 10 \neq 0 \vee \big(\right.\right.$$
$$-3\,\mu^6 + 34\,\mu^5 - 142\,\mu^4 + 266\,\mu^3 - 210\,\mu^2 + 30\,\mu \leq -25 \wedge \left(3\,\mu^6 - 34\,\mu^5\right.$$
$$+ 142\,\mu^4 - 266\,\mu^3 + 210\,\mu^2 - 30\,\mu - 25 \neq 0 \vee -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu$$
$$\leq 5\big)\big)\big) \wedge \left(\mu^4 - 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5 \neq 0 \vee 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2\right.$$
$$- 130\,\mu + 23 \neq 0 \vee 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \neq 0 \vee \left(-3\,\mu\right.$$
$$\leq -5 \wedge \left(-5 + 3\,\mu \neq 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25\right)\big)\big)\big)\big) \wedge \left(3\,\mu^2\right.$$
$$- 13\,\mu + 12 = 0 \vee 3\,\mu \leq 13 \vee \left(-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu\right.$$
$$\leq -24 \wedge 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0\big) \vee -9\,\mu^3$$
$$+ 78\,\mu^2 - 205\,\mu \leq -156\big) \wedge \left(\mu^2 - 4\,\mu + 1 = 0 \vee \mu^3 - 6\,\mu^2 + 9\,\mu - 2 = 0\right.$$
$$\vee \mu^3 - 5\,\mu^2 + 5\,\mu \leq 1 \vee -3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu < 2 \vee \mu^2 - 3\,\mu$$
$$\leq -2\big) \wedge \left(\left(\mu^2 - 5\,\mu + 5 = 0 \wedge 3\,\mu^2 - 13\,\mu + 12 = 0\right) \vee \left(3\,\mu \leq 13 \wedge \left(3\,\mu\right.\right.\right.$$
$$- 13 \neq 0 \vee \mu \leq 5\big)\big) \vee \left(-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu \leq -24\right.$$
$$\wedge \left(9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0 \vee \left(-6\,\mu^5 + 56\,\mu^4\right.\right.$$
$$- 184\,\mu^3 + 255\,\mu^2 - 143\,\mu \leq -22 \wedge \left(6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2\right.$$
$$+ 143\,\mu - 22 \neq 0 \vee -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \leq -5\big)\big)\big) \wedge \left(\mu^5\right.$$

$$-10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \ \vee\ 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2$$
$$+\,143\,\mu - 22 \neq 0 \ \vee\ 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0 \big)\big)$$
$$\vee\ \big(-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \leq -156 \ \wedge\ \big(9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0$$
$$\vee\ \big(-6\,\mu^3 + 56\,\mu^2 - 157\,\mu \leq -125 \ \wedge\ \big(6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \neq 0 \ \vee$$
$$-\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25\big)\big)\big)\big)\big) \ \wedge\ \big(\mu - 5 = 0 \ \vee\ \big(\mu^2 - 5\,\mu + 5 = 0 \ \wedge\ 3\,\mu^2$$
$$-\,13\,\mu + 12 = 0\big) \ \vee\ \mu \leq 5 \ \vee\ \big(-3\,\mu^2 + 28\,\mu \leq 65 \ \wedge\ 3\,\mu^2 - 28\,\mu + 65 \neq 0\big)$$
$$\vee\ \big(-3\,\mu^3 + 11\,\mu^2 - 13\,\mu \leq -5 \ \wedge\ \big(3\,\mu^3 - 11\,\mu^2 + 13\,\mu - 5 \neq 0 \ \vee\ \big(6\,\mu^5$$
$$-\,71\,\mu^4 + 293\,\mu^3 - 513\,\mu^2 + 385\,\mu \leq 100 \ \wedge\ \big(6\,\mu^5 - 71\,\mu^4 + 293\,\mu^3$$
$$-\,513\,\mu^2 + 385\,\mu - 100 \neq 0 \ \vee\ -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu$$
$$\leq -5\big)\big)\big) \ \wedge\ \big(\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \ \vee\ 6\,\mu^5 - 56\,\mu^4$$
$$+\,184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \ \vee\ 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2$$
$$+\,170\,\mu - 24 \neq 0\big)\big) \ \vee\ \big(3\,\mu \leq 5 \ \wedge\ \big(-5 + 3\,\mu \neq 0 \ \vee\ -\mu^3 + 10\,\mu^2 - 30\,\mu$$
$$\leq -25\big)\big)\big) \ \wedge\ \big(\mu^2 - 4\,\mu + 1 = 0 \ \vee\ \big(\mu^2 - 5\,\mu + 5 = 0 \ \wedge\ 3\,\mu^2 - 13\,\mu + 12$$
$$= 0\big) \ \vee\ \big(\mu^3 - 5\,\mu^2 + 5\,\mu \leq 1 \ \wedge\ \big(\mu^3 - 5\,\mu^2 + 5\,\mu - 1 \neq 0 \ \vee\ \mu \leq 5\big)\big) \ \vee\ \big($$
$$-3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu \leq 2 \ \wedge\ 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2 - 18\,\mu + 2 \neq 0\big)$$
$$\vee\ \big(\mu^2 - 3\,\mu \leq -2 \ \wedge\ \big(\mu^2 - 3\,\mu + 2 \neq 0 \ \vee\ -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2$$
$$-\,30\,\mu \leq -5\big) \ \wedge\ \big(\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \ \vee\ 6\,\mu^5$$
$$-\,56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \ \vee\ 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3$$
$$-\,318\,\mu^2 + 170\,\mu - 24 \neq 0\big)\big) \ \vee\ \big(\mu^2 - 3\,\mu \leq -2 \ \wedge\ \big(\mu^2 - 3\,\mu + 2 \neq 0$$
$$\vee\ \big(-3\,\mu^5 + 31\,\mu^4 - 116\,\mu^3 + 192\,\mu^2 - 137\,\mu \leq -25 \ \wedge\ \big(3\,\mu^5 - 31\,\mu^4$$
$$+\,116\,\mu^3 - 192\,\mu^2 + 137\,\mu - 25 \neq 0 \ \vee\ -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25\big)\big)\big)\big)\big)$$
$$\wedge\ \big(\mu^2 - 5\,\mu + 5 = 0 \ \vee\ \big(\mu^2 - 5\,\mu + 5 = 0 \ \wedge\ 3\,\mu^2 - 13\,\mu + 12 = 0\big) \ \vee\ \big(3\,\mu^3$$
$$-\,20\,\mu^2 + 40\,\mu \leq 25 \ \wedge\ \big(3\,\mu^3 - 20\,\mu^2 + 40\,\mu - 25 \neq 0 \ \vee\ \mu \leq 5\big)\big) \ \vee\ \big($$
$$-3\,\mu^4 + 28\,\mu^3 - 92\,\mu^2 + 125\,\mu \leq 60 \ \wedge\ 3\,\mu^4 - 28\,\mu^3 + 92\,\mu^2 - 125\,\mu + 60$$
$$\neq 0\big) \ \vee\ \big(-\mu^2 + 3\,\mu \leq 2 \ \wedge\ \big(\mu^2 - 3\,\mu + 2 \neq 0 \ \vee\ -\mu^5 + 10\,\mu^4 - 35\,\mu^3$$
$$+\,51\,\mu^2 - 30\,\mu \leq -5\big) \ \wedge\ \big(\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0$$
$$\vee\ 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \ \vee\ 9\,\mu^5 - 78\,\mu^4$$
$$+\,241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0\big)\big) \ \vee\ \big(-3\,\mu \leq -5 \ \wedge\ \big(-5 + 3\,\mu \neq 0$$
$$\vee\ -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25\big)\big)\big) \ \wedge\ \big(-3\,\mu \leq -13 \ \vee\ \big(-9\,\mu^4 + 78\,\mu^3$$
$$-\,205\,\mu^2 + 162\,\mu \leq 26 \ \wedge\ \big(9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \neq 0 \ \vee$$
$$-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \leq -156\big)\big)\big) \ \wedge\ \big(\mu^2 - 4\,\mu + 1 = 0 \ \vee\ -\mu^3 + 5\,\mu^2$$
$$-\,5\,\mu \leq -1 \ \vee\ -3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu < 2 \ \vee\ \mu^2 - 3\,\mu \leq -2\big) \ \wedge\ \big(\big($$
$$-3\,\mu \leq -13 \ \wedge\ \big(3\,\mu - 13 \neq 0 \ \vee\ -\mu \leq -5\big)\big) \ \vee\ \big(-9\,\mu^4 + 78\,\mu^3 - 205\,\mu^2$$

$$+\ 162\,\mu \le 26 \wedge \left(9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \ne 0 \vee \left(-6\,\mu^4\right.\right.$$
$$+\ 56\,\mu^3 - 157\,\mu^2 + 130\,\mu \le 23 \wedge \left(6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2 - 130\,\mu + 23 \ne 0\right.$$
$$\left.\left.\left.\vee -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu \le 5\right)\right)\right) \wedge \left(\mu^4 - 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5\right.$$
$$\ne 0 \vee 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2 - 130\,\mu + 23 \ne 0 \vee 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2$$
$$-\ 162\,\mu + 26 \ne 0 \vee \left(-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \le -156 \wedge \left(9\,\mu^3 - 78\,\mu^2\right.\right.$$
$$+\ 205\,\mu - 156 \ne 0 \vee \left(-6\,\mu^3 + 56\,\mu^2 - 157\,\mu \le -125 \wedge \left(6\,\mu^3 - 56\,\mu^2\right.\right.$$
$$\left.\left.\left.\left.\left.\left.\left.+\ 157\,\mu - 125 \ne 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \le -25\right)\right)\right)\right)\right)\right)\right) \wedge \left(\mu - 5 = 0\right.$$
$$\vee -\mu \le -5 \vee \left(-3\,\mu^2 + 28\,\mu \le 65 \wedge 3\,\mu^2 - 28\,\mu + 65 \ne 0\right) \vee \left(\mu^2 - 2\,\mu\right.$$
$$\le -1 \wedge \left(\mu^2 - 2\,\mu + 1 \ne 0 \vee -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu \le 5\right) \wedge \left(\mu^4\right.$$
$$-\ 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5 \ne 0 \vee 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2 - 130\,\mu + 23 \ne 0$$
$$\vee 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \ne 0 \vee \left(3\,\mu \le 5 \wedge \left(-5 + 3\,\mu \ne 0\right.\right.$$
$$\left.\left.\left.\left.\vee -\mu^3 + 10\,\mu^2 - 30\,\mu \le -25\right)\right)\right)\right) \wedge \left(\mu^2 - 4\,\mu + 1 = 0 \vee \left(-\mu^3 + 5\,\mu^2\right.\right.$$
$$\left.\left.-\ 5\,\mu \le -1 \wedge \left(\mu^3 - 5\,\mu^2 + 5\,\mu - 1 \ne 0 \vee -\mu \le -5\right)\right) \vee \left(-3\,\mu^4\right.\right.$$
$$\left.+\ 22\,\mu^3 - 45\,\mu^2 + 18\,\mu \le 2 \wedge 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2 - 18\,\mu + 2 \ne 0\right) \vee \bigg($$
$$-\mu^2 + 2\,\mu \le 1 \wedge \left(\mu^2 - 2\,\mu + 1 \ne 0 \vee -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu \le 5\right)$$
$$\wedge \left(\mu^4 - 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5 \ne 0 \vee 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2 - 130\,\mu\right.$$
$$+\ 23 \ne 0 \vee 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \ne 0 \vee \left(\mu^2 - 3\,\mu \le -2\right.$$
$$\wedge \left(\mu^2 - 3\,\mu + 2 \ne 0 \vee \left(-3\,\mu^5 + 31\,\mu^4 - 116\,\mu^3 + 192\,\mu^2 - 137\,\mu \le -25\right.\right.$$
$$\wedge \left(3\,\mu^5 - 31\,\mu^4 + 116\,\mu^3 - 192\,\mu^2 + 137\,\mu - 25 \ne 0 \vee -\mu^3 + 10\,\mu^2\right.$$
$$\left.\left.\left.\left.\left.\left.-\ 30\,\mu \le -25\right)\right)\right)\right)\right)\right) \wedge \left(\mu^2 - 5\,\mu + 5 = 0 \vee \left(-3\,\mu^3 + 20\,\mu^2 - 40\,\mu\right.\right.$$
$$\le -25 \wedge \left(3\,\mu^3 - 20\,\mu^2 + 40\,\mu - 25 \ne 0 \vee -\mu \le -5\right)\right) \vee \left(-3\,\mu^4\right.$$
$$\left.+\ 28\,\mu^3 - 92\,\mu^2 + 125\,\mu \le 60 \wedge 3\,\mu^4 - 28\,\mu^3 + 92\,\mu^2 - 125\,\mu + 60 \ne 0\right)$$
$$\vee \left(-3\,\mu^3 + 14\,\mu^2 - 21\,\mu \le -10 \wedge \left(3\,\mu^3 - 14\,\mu^2 + 21\,\mu - 10 \ne 0 \vee \bigg(\right.\right.$$
$$-3\,\mu^6 + 34\,\mu^5 - 142\,\mu^4 + 266\,\mu^3 - 210\,\mu^2 + 30\,\mu \le -25 \wedge \left(3\,\mu^6 - 34\,\mu^5\right.$$
$$\left.+\ 142\,\mu^4 - 266\,\mu^3 + 210\,\mu^2 - 30\,\mu - 25 \ne 0 \vee -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu\right.$$
$$\le 5\bigg)\bigg) \wedge \left(\mu^4 - 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5 \ne 0 \vee 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2\right.$$
$$-\ 130\,\mu + 23 \ne 0 \vee 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \ne 0 \vee \left(-3\,\mu\right.$$
$$\left.\left.\left.\left.\le -5 \wedge \left(-5 + 3\,\mu \ne 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \le -25\right)\right)\right)\right)\right) \wedge \left(3\,\mu^2\right.$$
$$-\ 13\,\mu + 12 = 0 \vee -3\,\mu \le -13 \vee \left(-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2\right.$$
$$\left.-\ 170\,\mu \le -24 \wedge 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \ne 0\right) \vee$$
$$-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \le -156\bigg) \wedge \left(\mu^2 - 4\,\mu + 1 = 0 \vee \mu^3 - 6\,\mu^2 + 9\,\mu\right.$$
$$-\ 2 = 0 \vee -\mu^3 + 5\,\mu^2 - 5\,\mu \le -1 \vee -3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu < 2$$
$$\left.\vee \mu^2 - 3\,\mu \le -2\right) \wedge \left(\left(\mu^2 - 5\,\mu + 5 = 0 \wedge 3\,\mu^2 - 13\,\mu + 12 = 0\right) \vee \left(-3\,\mu\right.\right.$$

$$\leq -13 \wedge (3\,\mu - 13 \neq 0 \vee -\mu \leq -5)) \vee (-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3$$
$$+ 318\,\mu^2 - 170\,\mu \leq -24 \wedge (9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24$$
$$\neq 0 \vee (-6\,\mu^5 + 56\,\mu^4 - 184\,\mu^3 + 255\,\mu^2 - 143\,\mu \leq -22 \wedge (6\,\mu^5 - 56\,\mu^4$$
$$+ 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \vee -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu$$
$$\leq -5))) \wedge (\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \vee 6\,\mu^5 - 56\,\mu^4$$
$$+ 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \vee 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2$$
$$+ 170\,\mu - 24 \neq 0)) \vee (-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \leq -156 \wedge (9\,\mu^3 - 78\,\mu^2$$
$$+ 205\,\mu - 156 \neq 0 \vee (-6\,\mu^3 + 56\,\mu^2 - 157\,\mu \leq -125 \wedge (6\,\mu^3 - 56\,\mu^2$$
$$+ 157\,\mu - 125 \neq 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25)))))) \wedge (\mu - 5 = 0$$
$$\vee (\mu^2 - 5\,\mu + 5 = 0 \wedge 3\,\mu^2 - 13\,\mu + 12 = 0) \vee -\mu \leq -5 \vee (-3\,\mu^2$$
$$+ 28\,\mu \leq 65 \wedge 3\,\mu^2 - 28\,\mu + 65 \neq 0) \vee (-3\,\mu^3 + 11\,\mu^2 - 13\,\mu \leq -5$$
$$\wedge (3\,\mu^3 - 11\,\mu^2 + 13\,\mu - 5 \neq 0 \vee (6\,\mu^5 - 71\,\mu^4 + 293\,\mu^3 - 513\,\mu^2 + 385\,\mu$$
$$\leq 100 \wedge (6\,\mu^5 - 71\,\mu^4 + 293\,\mu^3 - 513\,\mu^2 + 385\,\mu - 100 \neq 0 \vee -\mu^5$$
$$+ 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \leq -5))) \wedge (\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2$$
$$+ 30\,\mu - 5 \neq 0 \vee 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \vee 9\,\mu^5$$
$$- 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0)) \vee (3\,\mu \leq 5 \wedge (-5 + 3\,\mu$$
$$\neq 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25))) \wedge (\mu^2 - 4\,\mu + 1 = 0 \vee (\mu^2 - 5\,\mu$$
$$+ 5 = 0 \wedge 3\,\mu^2 - 13\,\mu + 12 = 0) \vee (-\mu^3 + 5\,\mu^2 - 5\,\mu \leq -1 \wedge (\mu^3 - 5\,\mu^2$$
$$+ 5\,\mu - 1 \neq 0 \vee -\mu \leq -5)) \vee (-3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu \leq 2$$
$$\wedge 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2 - 18\,\mu + 2 \neq 0) \vee (\mu^2 - 3\,\mu \leq -2 \wedge (\mu^2 - 3\,\mu$$
$$+ 2 \neq 0 \vee -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \leq -5) \wedge (\mu^5 - 10\,\mu^4$$
$$+ 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \vee 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu$$
$$- 22 \neq 0 \vee 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0)) \vee (\mu^2$$
$$- 3\,\mu \leq -2 \wedge (\mu^2 - 3\,\mu + 2 \neq 0 \vee (-3\,\mu^5 + 31\,\mu^4 - 116\,\mu^3 + 192\,\mu^2$$
$$- 137\,\mu \leq -25 \wedge (3\,\mu^5 - 31\,\mu^4 + 116\,\mu^3 - 192\,\mu^2 + 137\,\mu - 25 \neq 0 \vee$$
$$-\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25))))) \wedge (\mu^2 - 5\,\mu + 5 = 0 \vee (\mu^2 - 5\,\mu + 5 = 0$$
$$\wedge 3\,\mu^2 - 13\,\mu + 12 = 0) \vee (-3\,\mu^3 + 20\,\mu^2 - 40\,\mu \leq -25 \wedge (3\,\mu^3 - 20\,\mu^2$$
$$+ 40\,\mu - 25 \neq 0 \vee -\mu \leq -5)) \vee (-3\,\mu^4 + 28\,\mu^3 - 92\,\mu^2 + 125\,\mu \leq 60$$
$$\wedge 3\,\mu^4 - 28\,\mu^3 + 92\,\mu^2 - 125\,\mu + 60 \neq 0) \vee (-\mu^2 + 3\,\mu \leq 2 \wedge (\mu^2 - 3\,\mu$$
$$+ 2 \neq 0 \vee -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \leq -5) \wedge (\mu^5 - 10\,\mu^4$$
$$+ 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \vee 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu$$
$$- 22 \neq 0 \vee 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0)) \vee (-3\,\mu$$
$$\leq -5 \wedge (-5 + 3\,\mu \neq 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25))) \wedge (3\,\mu^2$$

$$-13\,\mu + 12 = 0 \vee -9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu \le -24 \vee 3\,\mu$$
$$< 13\big) \wedge \big(\mu \le 5 \vee 3\,\mu^2 - 20\,\mu + 25 = 0 \vee -3\,\mu^2 + 28\,\mu < 65 \vee -3\,\mu^3$$
$$+ 11\,\mu^2 - 13\,\mu \le -5\big) \wedge \big(-\mu \le -5 \vee 3\,\mu^2 - 20\,\mu + 25 = 0 \vee -3\,\mu^2$$
$$+ 28\,\mu < 65 \vee -3\,\mu^3 + 11\,\mu^2 - 13\,\mu \le -5\big) \wedge \big(\big(\mu^2 - 5\,\mu + 5 = 0 \wedge 3\,\mu^2$$
$$- 13\,\mu + 12 = 0\big) \vee \big(-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu \le -24$$
$$\wedge \big(9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \ne 0 \vee \big(-6\,\mu^5 + 56\,\mu^4$$
$$- 184\,\mu^3 + 255\,\mu^2 - 143\,\mu \le -22 \wedge \big(6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2$$
$$+ 143\,\mu - 22 \ne 0 \vee -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \le -5\big)\big)\big)\big)$$
$$\vee \big(3\,\mu \le 13 \wedge \big(3\,\mu - 13 \ne 0 \vee \big(3\,\mu \le 14 \wedge \big(3\,\mu - 14 \ne 0 \vee \mu$$
$$< 5\big)\big)\big)\big)\big) \wedge \big(\mu^2 - 4\,\mu + 1 = 0 \vee \big(\mu^2 - 5\,\mu + 5 = 0 \wedge 3\,\mu^2 - 13\,\mu + 12$$
$$= 0\big) \vee \big(-3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu \le 2 \wedge 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2 - 18\,\mu$$
$$+ 2 \ne 0\big) \vee \big(\mu^2 - 3\,\mu \le -2 \wedge \big(\mu^2 - 3\,\mu + 2 \ne 0 \vee -\mu^5 + 10\,\mu^4 - 35\,\mu^3$$
$$+ 51\,\mu^2 - 30\,\mu \le -5\big)\big) \vee \big(-2\,\mu^2 + 3\,\mu \le 1 \wedge \big(2\,\mu^2 - 3\,\mu + 1 \ne 0 \vee \big($$
$$-\mu^4 + 11\,\mu^3 - 33\,\mu^2 + 23\,\mu \le 4 \wedge \big(\mu^4 - 11\,\mu^3 + 33\,\mu^2 - 23\,\mu + 4 \ne 0 \vee \mu$$
$$< 5\big)\big)\big)\big)\big) \wedge \big(\mu^2 - 5\,\mu + 5 = 0 \vee \big(\mu^2 - 5\,\mu + 5 = 0 \wedge 3\,\mu^2 - 13\,\mu + 12$$
$$= 0\big) \vee \big(-3\,\mu^4 + 28\,\mu^3 - 92\,\mu^2 + 125\,\mu \le 60 \wedge 3\,\mu^4 - 28\,\mu^3 + 92\,\mu^2$$
$$- 125\,\mu + 60 \ne 0\big) \vee \big(-\mu^2 + 3\,\mu \le 2 \wedge \big(\mu^2 - 3\,\mu + 2 \ne 0 \vee -\mu^5$$
$$+ 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \le -5\big)\big) \vee \big(-6\,\mu^2 + 19\,\mu \le 15 \wedge \big(6\,\mu^2$$
$$- 19\,\mu + 15 \ne 0 \vee \big(-\mu^4 + 13\,\mu^3 - 55\,\mu^2 + 90\,\mu \le 50 \wedge \big(\mu^4 - 13\,\mu^3$$
$$+ 55\,\mu^2 - 90\,\mu + 50 \ne 0 \vee \mu < 5\big)\big)\big)\big) \wedge 3\,\mu^3 - 13\,\mu^2 + 12\,\mu \le 2$$
$$\wedge \big(3\,\mu^3 - 13\,\mu^2 + 12\,\mu - 2 \ne 0 \vee 3\,\mu^2 - 13\,\mu \le -12\big) \wedge \big(\mu \le 5 \vee -3\,\mu^2$$
$$+ 28\,\mu < 65 \vee \big(\mu^2 - 2\,\mu \le -1 \wedge \big(\mu^2 - 2\,\mu + 1 \ne 0 \vee 3\,\mu \le 5\big) \wedge \big(-5$$
$$+ 3\,\mu \ne 0 \vee \mu - 3 \ne 0\big)\big)\big) \wedge \big(-\mu \le -5 \vee -3\,\mu^2 + 28\,\mu < 65 \vee \big(\mu^2$$
$$- 2\,\mu \le -1 \wedge \big(\mu^2 - 2\,\mu + 1 \ne 0 \vee 3\,\mu \le 5\big) \wedge \big(-5 + 3\,\mu \ne 0 \vee \mu - 3$$
$$\ne 0\big)\big) \wedge \big(\mu^2 - 5\,\mu + 5 = 0 \vee -3\,\mu^4 + 28\,\mu^3 - 92\,\mu^2 + 125\,\mu < 60 \vee \big($$
$$-2\,\mu^3 + 9\,\mu^2 - 13\,\mu \le -6 \wedge \big(2\,\mu^3 - 9\,\mu^2 + 13\,\mu - 6 \ne 0 \vee -6\,\mu^2 + 19\,\mu$$
$$< 15\big)\big) \wedge \big(\mu^2 - 4\,\mu + 1 = 0 \vee -3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu < 2 \vee \big(2\,\mu^2$$
$$- 5\,\mu \le -2 \wedge \big(2\,\mu^2 - 5\,\mu + 2 \ne 0 \vee 2\,\mu^3 - 5\,\mu^2 + 2\,\mu \ne 0 \vee -2\,\mu^2$$
$$+ 3\,\mu < 1\big)\big)\big) \wedge \big(3\,\mu^3 - 13\,\mu^2 + 12\,\mu - 2 \ne 0 \vee \big(6\,\mu^3 - 28\,\mu^2 + 27\,\mu \le 5$$
$$\wedge \big(6\,\mu^3 - 28\,\mu^2 + 27\,\mu - 5 \ne 0 \vee \mu^3 - 5\,\mu^2 + 5\,\mu \le 1\big)\big)\big) \wedge \big(\mu^3 - 5\,\mu^2$$
$$+ 5\,\mu - 1 \ne 0 \vee 6\,\mu^3 - 28\,\mu^2 + 27\,\mu - 5 \ne 0 \vee 3\,\mu^3 - 13\,\mu^2 + 12\,\mu - 2$$
$$\ne 0 \vee \big(3\,\mu^2 - 13\,\mu \le -12 \wedge \big(3\,\mu^2 - 13\,\mu + 12 \ne 0 \vee \big(6\,\mu^2 - 28\,\mu$$
$$\le -27 \wedge \big(6\,\mu^2 - 28\,\mu + 27 \ne 0 \vee \mu^2 - 5\,\mu \le -5\big)\big)\big)\big)\big) \wedge \big(-\mu \le -5$$

$$\vee \left(-3\,\mu^2 + 28\,\mu \le 65 \wedge 3\,\mu^2 - 28\,\mu + 65 \ne 0\right) \vee \left(\mu^2 - 2\,\mu \le -1 \wedge \left(\mu^2\right.\right.$$
$$\left.- 2\,\mu + 1 \ne 0 \vee \left(-2\,\mu^4 + 17\,\mu^3 - 39\,\mu^2 + 19\,\mu \le -5 \wedge \left(2\,\mu^4 - 17\,\mu^3\right.\right.\right.$$
$$\left.\left.+ 39\,\mu^2 - 19\,\mu - 5 \ne 0 \vee \mu^3 - 5\,\mu^2 + 5\,\mu \le 1\right)\right)\right) \wedge \left(\mu^3 - 5\,\mu^2 + 5\,\mu - 1\right.$$
$$\ne 0 \vee 6\,\mu^3 - 28\,\mu^2 + 27\,\mu - 5 \ne 0 \vee 3\,\mu^3 - 13\,\mu^2 + 12\,\mu - 2 \ne 0 \vee \left(3\,\mu\right.$$
$$\le 5 \wedge \left(-5 + 3\,\mu \ne 0 \vee \left(-2\,\mu^3 + 17\,\mu^2 - 40\,\mu \le -25 \wedge \left(2\,\mu^3 - 17\,\mu^2\right.\right.\right.$$
$$\left.\left.\left.\left.\left.\left.+ 40\,\mu - 25 \ne 0 \vee \mu^2 - 5\,\mu \le -5\right)\right)\right)\right)\right)\right) \wedge \left(\mu \le 5 \vee \left(-3\,\mu^2 + 28\,\mu\right.\right.$$
$$\left.\le 65 \wedge 3\,\mu^2 - 28\,\mu + 65 \ne 0\right) \vee \left(\mu^2 - 2\,\mu \le -1 \wedge \left(\mu^2 - 2\,\mu + 1 \ne 0\right.\right.$$
$$\vee \left(-2\,\mu^4 + 17\,\mu^3 - 39\,\mu^2 + 19\,\mu \le -5 \wedge \left(2\,\mu^4 - 17\,\mu^3 + 39\,\mu^2 - 19\,\mu\right.\right.$$
$$\left.\left.- 5 \ne 0 \vee \mu^3 - 5\,\mu^2 + 5\,\mu \le 1\right)\right)\right) \wedge \left(\mu^3 - 5\,\mu^2 + 5\,\mu - 1 \ne 0 \vee 6\,\mu^3\right.$$
$$- 28\,\mu^2 + 27\,\mu - 5 \ne 0 \vee 3\,\mu^3 - 13\,\mu^2 + 12\,\mu - 2 \ne 0 \vee \left(3\,\mu \le 5 \wedge \left(-5\right.\right.$$
$$\left.+ 3\,\mu \ne 0 \vee \left(-2\,\mu^3 + 17\,\mu^2 - 40\,\mu \le -25 \wedge \left(2\,\mu^3 - 17\,\mu^2 + 40\,\mu - 25\right.\right.\right.$$
$$\left.\left.\left.\left.\left.\left.\ne 0 \vee \mu^2 - 5\,\mu \le -5\right)\right)\right)\right)\right)\right) \wedge \left(\mu^2 - 4\,\mu + 1 = 0 \vee \left(-3\,\mu^4 + 22\,\mu^3\right.\right.$$
$$\left.- 45\,\mu^2 + 18\,\mu \le 2 \wedge 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2 - 18\,\mu + 2 \ne 0\right) \vee \left(-2\,\mu^2\right.$$
$$\left.+ 3\,\mu \le 1 \wedge \left(2\,\mu^2 - 3\,\mu + 1 \ne 0 \vee \mu^3 - 5\,\mu^2 + 5\,\mu \le 1\right) \wedge \left(\mu^3 - 5\,\mu^2\right.\right.$$
$$+ 5\,\mu - 1 \ne 0 \vee 6\,\mu^3 - 28\,\mu^2 + 27\,\mu - 5 \ne 0 \vee 3\,\mu^3 - 13\,\mu^2 + 12\,\mu - 2$$
$$\ne 0 \vee \left(2\,\mu^2 - 5\,\mu \le -2 \wedge \left(2\,\mu^2 - 5\,\mu + 2 \ne 0 \vee \left(-2\,\mu^5 + 19\,\mu^4 - 62\,\mu^3\right.\right.\right.$$
$$\left.+ 82\,\mu^2 - 44\,\mu \le -7 \wedge \left(2\,\mu^5 - 19\,\mu^4 + 62\,\mu^3 - 82\,\mu^2 + 44\,\mu - 7 \ne 0\right.\right.$$
$$\left.\left.\left.\left.\left.\left.\vee \mu^2 - 5\,\mu \le -5\right)\right)\right)\right)\right)\right) \wedge \left(\mu^2 - 5\,\mu + 5 = 0 \vee \left(-3\,\mu^4 + 28\,\mu^3 - 92\,\mu^2\right.\right.$$
$$\left.+ 125\,\mu \le 60 \wedge 3\,\mu^4 - 28\,\mu^3 + 92\,\mu^2 - 125\,\mu + 60 \ne 0\right) \vee \left(-2\,\mu^3 + 9\,\mu^2\right.$$
$$\left.- 13\,\mu \le -6 \wedge \left(2\,\mu^3 - 9\,\mu^2 + 13\,\mu - 6 \ne 0 \vee \left(-2\,\mu^6 + 23\,\mu^5 - 99\,\mu^4\right.\right.\right.$$
$$\left.+ 199\,\mu^3 - 191\,\mu^2 + 75\,\mu \le 5 \wedge \left(2\,\mu^6 - 23\,\mu^5 + 99\,\mu^4 - 199\,\mu^3 + 191\,\mu^2\right.\right.$$
$$\left.\left.\left.- 75\,\mu + 5 \ne 0 \vee \mu^3 - 5\,\mu^2 + 5\,\mu \le 1\right)\right)\right) \wedge \left(\mu^3 - 5\,\mu^2 + 5\,\mu - 1 \ne 0\right.$$
$$\vee 6\,\mu^3 - 28\,\mu^2 + 27\,\mu - 5 \ne 0 \vee 3\,\mu^3 - 13\,\mu^2 + 12\,\mu - 2 \ne 0 \vee \left(-2\,\mu\right.$$
$$\left.\left.\left.\le -3 \wedge \left(2\,\mu - 3 \ne 0 \vee \mu^2 - 5\,\mu \le -5\right)\right)\right)\right) \wedge \left(3\,\mu^2 - 13\,\mu + 12 = 0\right.$$
$$\vee \left(-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu \le -24 \wedge 9\,\mu^5 - 78\,\mu^4\right.$$
$$\left.+ 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \ne 0\right) \vee 3\,\mu^2 - 13\,\mu \le -12\right) \wedge \left(\mu \le 5\right.$$
$$\vee 3\,\mu^2 - 20\,\mu + 25 = 0 \vee -3\,\mu^2 + 28\,\mu < 65 \vee \left(-3\,\mu^3 + 11\,\mu^2 - 13\,\mu\right.$$
$$\left.\le -5 \wedge 3\,\mu^3 - 11\,\mu^2 + 13\,\mu - 5 \ne 0\right) \vee \left(3\,\mu \le 5 \wedge \left(-5 + 3\,\mu \ne 0 \vee \mu\right.\right.$$
$$\left.\left.- 3 \ne 0\right)\right)\right) \wedge \left(-\mu \le -5 \vee 3\,\mu^2 - 20\,\mu + 25 = 0 \vee -3\,\mu^2 + 28\,\mu < 65\right.$$
$$\vee \left(-3\,\mu^3 + 11\,\mu^2 - 13\,\mu \le -5 \wedge 3\,\mu^3 - 11\,\mu^2 + 13\,\mu - 5 \ne 0\right) \vee \left(3\,\mu\right.$$
$$\left.\left.\le 5 \wedge \left(-5 + 3\,\mu \ne 0 \vee \mu - 3 \ne 0\right)\right)\right) \wedge \left(\mu^2 - 4\,\mu + 1 = 0 \vee \mu^3 - 6\,\mu^2\right.$$
$$+ 9\,\mu - 2 = 0 \vee -3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu < 2 \vee \left(2\,\mu^2 - 5\,\mu \le -2\right.$$
$$\left.\left.\wedge \left(2\,\mu^2 - 5\,\mu + 2 \ne 0 \vee 2\,\mu^3 - 5\,\mu^2 + 2\,\mu \ne 0 \vee -2\,\mu^2 + 3\,\mu < 1\right)\right)\right)$$

$$\wedge \left(\left(\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12 = 0\right) \vee \left(-9\mu^5 + 78\mu^4 - 241\mu^3\right.\right.$$
$$+ 318\mu^2 - 170\mu \le -24 \wedge \left(9\mu^5 - 78\mu^4 + 241\mu^3 - 318\mu^2 + 170\mu - 24\right.$$
$$\neq 0 \vee \left(-6\mu^5 + 56\mu^4 - 184\mu^3 + 255\mu^2 - 143\mu \le -22 \wedge \left(6\mu^5 - 56\mu^4\right.\right.$$
$$+ 184\mu^3 - 255\mu^2 + 143\mu - 22 \neq 0 \vee -\mu^5 + 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu$$
$$\left.\left.\left.\le -5\right)\right)\right) \wedge \left(\mu^5 - 10\mu^4 + 35\mu^3 - 51\mu^2 + 30\mu - 5 \neq 0 \vee 6\mu^5 - 56\mu^4\right.$$
$$+ 184\mu^3 - 255\mu^2 + 143\mu - 22 \neq 0 \vee 9\mu^5 - 78\mu^4 + 241\mu^3 - 318\mu^2$$
$$\left.\left.+ 170\mu - 24 \neq 0\right)\right) \vee \left(3\mu^2 - 13\mu \le -12 \wedge \left(3\mu^2 - 13\mu + 12 \neq 0\right.\right.$$
$$\left.\left.\left.\left.\vee \left(6\mu^2 - 28\mu \le -27 \wedge \left(6\mu^2 - 28\mu + 27 \neq 0 \vee \mu^2 - 5\mu \le -5\right)\right)\right)\right)\right)\right)$$
$$\wedge \left(-\mu \le -5 \vee \left(\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12 = 0\right) \vee \left(-3\mu^2\right.\right.$$
$$+ 28\mu \le 65 \wedge 3\mu^2 - 28\mu + 65 \neq 0\right) \vee \left(-3\mu^3 + 11\mu^2 - 13\mu \le -5\right.$$
$$\wedge \left(3\mu^3 - 11\mu^2 + 13\mu - 5 \neq 0 \vee \left(6\mu^5 - 71\mu^4 + 293\mu^3 - 513\mu^2 + 385\mu\right.\right.$$
$$\le 100 \wedge \left(6\mu^5 - 71\mu^4 + 293\mu^3 - 513\mu^2 + 385\mu - 100 \neq 0 \vee -\mu^5\right.$$
$$\left.\left.\left.+ 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \le -5\right)\right)\right) \wedge \left(\mu^5 - 10\mu^4 + 35\mu^3 - 51\mu^2\right.$$
$$+ 30\mu - 5 \neq 0 \vee 6\mu^5 - 56\mu^4 + 184\mu^3 - 255\mu^2 + 143\mu - 22 \neq 0 \vee 9\mu^5$$
$$\left.\left.- 78\mu^4 + 241\mu^3 - 318\mu^2 + 170\mu - 24 \neq 0\right)\right) \vee \left(3\mu \le 5 \wedge \left(-5 + 3\mu\right.\right.$$
$$\neq 0 \vee \left(-2\mu^3 + 17\mu^2 - 40\mu \le -25 \wedge \left(2\mu^3 - 17\mu^2 + 40\mu - 25 \neq 0\right.\right.$$
$$\left.\left.\left.\left.\left.\vee \mu^2 - 5\mu \le -5\right)\right)\right)\right)\right) \wedge \left(\mu \le 5 \vee \left(\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12\right.\right.$$
$$= 0\right) \vee \left(-3\mu^2 + 28\mu \le 65 \wedge 3\mu^2 - 28\mu + 65 \neq 0\right) \vee \left(-3\mu^3 + 11\mu^2\right.$$
$$- 13\mu \le -5 \wedge \left(3\mu^3 - 11\mu^2 + 13\mu - 5 \neq 0 \vee \left(6\mu^5 - 71\mu^4 + 293\mu^3\right.\right.$$
$$- 513\mu^2 + 385\mu \le 100 \wedge \left(6\mu^5 - 71\mu^4 + 293\mu^3 - 513\mu^2 + 385\mu - 100\right.$$
$$\left.\left.\left.\neq 0 \vee -\mu^5 + 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \le -5\right)\right)\right) \wedge \left(\mu^5 - 10\mu^4\right.$$
$$+ 35\mu^3 - 51\mu^2 + 30\mu - 5 \neq 0 \vee 6\mu^5 - 56\mu^4 + 184\mu^3 - 255\mu^2 + 143\mu$$
$$\left.\left.- 22 \neq 0 \vee 9\mu^5 - 78\mu^4 + 241\mu^3 - 318\mu^2 + 170\mu - 24 \neq 0\right)\right) \vee \left(3\mu\right.$$
$$\le 5 \wedge \left(-5 + 3\mu \neq 0 \vee \left(-2\mu^3 + 17\mu^2 - 40\mu \le -25 \wedge \left(2\mu^3 - 17\mu^2\right.\right.\right.$$
$$\left.\left.\left.\left.+ 40\mu - 25 \neq 0 \vee \mu^2 - 5\mu \le -5\right)\right)\right)\right) \wedge \left(\mu^2 - 4\mu + 1 = 0 \vee \left(\mu^2 - 5\mu\right.\right.$$
$$+ 5 = 0 \wedge 3\mu^2 - 13\mu + 12 = 0\right) \vee \left(-3\mu^4 + 22\mu^3 - 45\mu^2 + 18\mu \le 2\right.$$
$$\wedge 3\mu^4 - 22\mu^3 + 45\mu^2 - 18\mu + 2 \neq 0\right) \vee \left(\mu^2 - 3\mu \le -2 \wedge \left(\mu^2 - 3\mu\right.\right.$$
$$+ 2 \neq 0 \vee -\mu^5 + 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \le -5\right) \wedge \left(\mu^5 - 10\mu^4\right.$$
$$+ 35\mu^3 - 51\mu^2 + 30\mu - 5 \neq 0 \vee 6\mu^5 - 56\mu^4 + 184\mu^3 - 255\mu^2 + 143\mu$$
$$\left.\left.- 22 \neq 0 \vee 9\mu^5 - 78\mu^4 + 241\mu^3 - 318\mu^2 + 170\mu - 24 \neq 0\right)\right) \vee \left(2\mu^2\right.$$
$$- 5\mu \le -2 \wedge \left(2\mu^2 - 5\mu + 2 \neq 0 \vee \left(-2\mu^5 + 19\mu^4 - 62\mu^3 + 82\mu^2\right.\right.$$
$$- 44\mu \le -7 \wedge \left(2\mu^5 - 19\mu^4 + 62\mu^3 - 82\mu^2 + 44\mu - 7 \neq 0 \vee \mu^2 - 5\mu\right.$$
$$\left.\left.\left.\left.\le -5\right)\right)\right)\right) \wedge \left(\mu^2 - 5\mu + 5 = 0 \vee \left(\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12\right.\right.$$

$$= 0) \vee (-3\mu^4 + 28\mu^3 - 92\mu^2 + 125\mu \le 60 \wedge 3\mu^4 - 28\mu^3 + 92\mu^2$$
$$- 125\mu + 60 \ne 0) \vee (-\mu^2 + 3\mu \le 2 \wedge (\mu^2 - 3\mu + 2 \ne 0 \vee -\mu^5$$
$$+ 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \le -5) \wedge (\mu^5 - 10\mu^4 + 35\mu^3 - 51\mu^2$$
$$+ 30\mu - 5 \ne 0 \vee 6\mu^5 - 56\mu^4 + 184\mu^3 - 255\mu^2 + 143\mu - 22 \ne 0 \vee 9\mu^5$$
$$- 78\mu^4 + 241\mu^3 - 318\mu^2 + 170\mu - 24 \ne 0)) \vee (-2\mu \le -3 \wedge (2\mu$$
$$- 3 \ne 0 \vee \mu^2 - 5\mu \le -5))) \wedge (3\mu^2 - 13\mu + 12 = 0 \vee -3\mu \le -13 \vee$$
$$-9\mu^5 + 78\mu^4 - 241\mu^3 + 318\mu^2 - 170\mu \le -24 \vee 3\mu < 13) \wedge ((\mu^2$$
$$- 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12 = 0) \vee (-3\mu \le -13 \wedge (3\mu - 13 \ne 0$$
$$\vee -\mu \le -5)) \vee (-9\mu^5 + 78\mu^4 - 241\mu^3 + 318\mu^2 - 170\mu \le -24$$
$$\wedge (9\mu^5 - 78\mu^4 + 241\mu^3 - 318\mu^2 + 170\mu - 24 \ne 0 \vee (-6\mu^5 + 56\mu^4$$
$$- 184\mu^3 + 255\mu^2 - 143\mu \le -22 \wedge (6\mu^5 - 56\mu^4 + 184\mu^3 - 255\mu^2$$
$$+ 143\mu - 22 \ne 0 \vee -\mu^5 + 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \le -5))))$$
$$\vee (3\mu \le 13 \wedge (3\mu - 13 \ne 0 \vee (3\mu \le 14 \wedge (3\mu - 14 \ne 0 \vee \mu$$
$$< 5)))))) \wedge (\mu^2 - 4\mu + 1 = 0 \vee (\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12$$
$$= 0) \vee (-\mu^3 + 5\mu^2 - 5\mu \le -1 \wedge (\mu^3 - 5\mu^2 + 5\mu - 1 \ne 0 \vee -\mu$$
$$\le -5)) \vee (-3\mu^4 + 22\mu^3 - 45\mu^2 + 18\mu \le 2 \wedge 3\mu^4 - 22\mu^3 + 45\mu^2$$
$$- 18\mu + 2 \ne 0) \vee (\mu^2 - 3\mu \le -2 \wedge (\mu^2 - 3\mu + 2 \ne 0 \vee -\mu^5 + 10\mu^4$$
$$- 35\mu^3 + 51\mu^2 - 30\mu \le -5)) \vee (-2\mu^2 + 3\mu \le 1 \wedge (2\mu^2 - 3\mu + 1$$
$$\ne 0 \vee (-\mu^4 + 11\mu^3 - 33\mu^2 + 23\mu \le 4 \wedge (\mu^4 - 11\mu^3 + 33\mu^2 - 23\mu + 4$$
$$\ne 0 \vee \mu < 5)))))) \wedge (\mu^2 - 5\mu + 5 = 0 \vee (\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu$$
$$+ 12 = 0) \vee (-3\mu^3 + 20\mu^2 - 40\mu \le -25 \wedge (3\mu^3 - 20\mu^2 + 40\mu - 25$$
$$\ne 0 \vee -\mu \le -5)) \vee (-3\mu^4 + 28\mu^3 - 92\mu^2 + 125\mu \le 60 \wedge 3\mu^4$$
$$- 28\mu^3 + 92\mu^2 - 125\mu + 60 \ne 0) \vee (-\mu^2 + 3\mu \le 2 \wedge (\mu^2 - 3\mu + 2$$
$$\ne 0 \vee -\mu^5 + 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \le -5)) \vee (-6\mu^2 + 19\mu$$
$$\le 15 \wedge (6\mu^2 - 19\mu + 15 \ne 0 \vee (-\mu^4 + 13\mu^3 - 55\mu^2 + 90\mu \le 50 \wedge (\mu^4$$
$$- 13\mu^3 + 55\mu^2 - 90\mu + 50 \ne 0 \vee \mu < 5)))) \wedge (-3\mu \le -13 \vee ($$
$$-9\mu^4 + 78\mu^3 - 205\mu^2 + 162\mu \le 26 \wedge (9\mu^4 - 78\mu^3 + 205\mu^2 - 162\mu$$
$$+ 26 \ne 0 \vee -9\mu^3 + 78\mu^2 - 205\mu \le -156) \wedge (9\mu^3 - 78\mu^2 + 205\mu$$
$$- 156 \ne 0 \vee 3\mu - 13 \ne 0)) \vee 3\mu < 13) \wedge (\mu^2 - 5\mu + 5 = 0 \vee -3\mu^3$$
$$+ 20\mu^2 - 40\mu \le -25 \vee -3\mu^4 + 28\mu^3 - 92\mu^2 + 125\mu < 60 \vee (-3\mu^3$$
$$+ 14\mu^2 - 21\mu \le -10 \wedge 3\mu^3 - 14\mu^2 + 21\mu - 10 \ne 0) \vee -6\mu^2 + 19\mu$$
$$< 15) \wedge (\mu^2 - 4\mu + 1 = 0 \vee -\mu^3 + 5\mu^2 - 5\mu \le -1 \vee -3\mu^4 + 22\mu^3$$
$$- 45\mu^2 + 18\mu < 2 \vee (\mu^2 - 3\mu \le -2 \wedge (\mu^2 - 3\mu + 2 \ne 0 \vee \mu^3 - 3\mu^2$$

$$+ 2\mu \neq 0)) \vee -2\mu^2 + 3\mu < 1) \wedge ((-3\mu \leq -13 \wedge (3\mu - 13 \neq 0 \vee$$
$$-\mu \leq -5)) \vee (-9\mu^4 + 78\mu^3 - 205\mu^2 + 162\mu \leq 26 \wedge (9\mu^4 - 78\mu^3$$
$$+ 205\mu^2 - 162\mu + 26 \neq 0 \vee (-6\mu^4 + 56\mu^3 - 157\mu^2 + 130\mu \leq 23$$
$$\wedge (6\mu^4 - 56\mu^3 + 157\mu^2 - 130\mu + 23 \neq 0 \vee -\mu^4 + 10\mu^3 - 30\mu^2 + 26\mu$$
$$\leq 5))) \wedge (\mu^4 - 10\mu^3 + 30\mu^2 - 26\mu + 5 \neq 0 \vee 6\mu^4 - 56\mu^3 + 157\mu^2$$
$$- 130\mu + 23 \neq 0 \vee 9\mu^4 - 78\mu^3 + 205\mu^2 - 162\mu + 26 \neq 0 \vee (-9\mu^3$$
$$+ 78\mu^2 - 205\mu \leq -156 \wedge (9\mu^3 - 78\mu^2 + 205\mu - 156 \neq 0 \vee (-6\mu^3$$
$$+ 56\mu^2 - 157\mu \leq -125 \wedge (6\mu^3 - 56\mu^2 + 157\mu - 125 \neq 0 \vee -\mu^3$$
$$+ 10\mu^2 - 30\mu \leq -25))))) \wedge (\mu^3 - 10\mu^2 + 30\mu - 25 \neq 0 \vee 6\mu^3$$
$$- 56\mu^2 + 157\mu - 125 \neq 0 \vee 9\mu^3 - 78\mu^2 + 205\mu - 156 \neq 0 \vee \mu - 5 \neq 0$$
$$\vee 5\mu - 23 \neq 0 \vee 3\mu - 13 \neq 0)) \vee (3\mu \leq 13 \wedge (3\mu - 13 \neq 0 \vee (3\mu$$
$$\leq 14 \wedge (3\mu - 14 \neq 0 \vee \mu < 5)))))) \wedge (\mu^2 - 4\mu + 1 = 0 \vee (-\mu^3 + 5\mu^2$$
$$- 5\mu \leq -1 \wedge (\mu^3 - 5\mu^2 + 5\mu - 1 \neq 0 \vee -\mu \leq -5)) \vee (-3\mu^4$$
$$+ 22\mu^3 - 45\mu^2 + 18\mu \leq 2 \wedge 3\mu^4 - 22\mu^3 + 45\mu^2 - 18\mu + 2 \neq 0) \vee ($$
$$-\mu^2 + 2\mu \leq 1 \wedge (\mu^2 - 2\mu + 1 \neq 0 \vee -\mu^4 + 10\mu^3 - 30\mu^2 + 26\mu \leq 5)$$
$$\wedge (\mu^4 - 10\mu^3 + 30\mu^2 - 26\mu + 5 \neq 0 \vee 6\mu^4 - 56\mu^3 + 157\mu^2 - 130\mu$$
$$+ 23 \neq 0 \vee 9\mu^4 - 78\mu^3 + 205\mu^2 - 162\mu + 26 \neq 0 \vee (\mu^2 - 3\mu \leq -2$$
$$\wedge (\mu^2 - 3\mu + 2 \neq 0 \vee (-3\mu^5 + 31\mu^4 - 116\mu^3 + 192\mu^2 - 137\mu \leq -25$$
$$\wedge (3\mu^5 - 31\mu^4 + 116\mu^3 - 192\mu^2 + 137\mu - 25 \neq 0 \vee -\mu^3 + 10\mu^2$$
$$- 30\mu \leq -25))))) \wedge (\mu^3 - 10\mu^2 + 30\mu - 25 \neq 0 \vee 6\mu^3 - 56\mu^2$$
$$+ 157\mu - 125 \neq 0 \vee 9\mu^3 - 78\mu^2 + 205\mu - 156 \neq 0 \vee \mu - 5 \neq 0 \vee 5\mu$$
$$- 23 \neq 0 \vee 3\mu - 13 \neq 0)) \vee (-2\mu^2 + 3\mu \leq 1 \wedge (2\mu^2 - 3\mu + 1 \neq 0$$
$$\vee (-\mu^4 + 11\mu^3 - 33\mu^2 + 23\mu \leq 4 \wedge (\mu^4 - 11\mu^3 + 33\mu^2 - 23\mu + 4 \neq 0$$
$$\vee \mu < 5))))) \wedge (\mu^2 - 5\mu + 5 = 0 \vee (-3\mu^3 + 20\mu^2 - 40\mu \leq -25$$
$$\wedge (3\mu^3 - 20\mu^2 + 40\mu - 25 \neq 0 \vee -\mu \leq -5)) \vee (-3\mu^4 + 28\mu^3$$
$$- 92\mu^2 + 125\mu \leq 60 \wedge 3\mu^4 - 28\mu^3 + 92\mu^2 - 125\mu + 60 \neq 0) \vee (-3\mu^3$$
$$+ 14\mu^2 - 21\mu \leq -10 \wedge (3\mu^3 - 14\mu^2 + 21\mu - 10 \neq 0 \vee (-3\mu^6 + 34\mu^5$$
$$- 142\mu^4 + 266\mu^3 - 210\mu^2 + 30\mu \leq -25 \wedge (3\mu^6 - 34\mu^5 + 142\mu^4$$
$$- 266\mu^3 + 210\mu^2 - 30\mu - 25 \neq 0 \vee -\mu^4 + 10\mu^3 - 30\mu^2 + 26\mu \leq 5)))$$
$$\wedge (\mu^4 - 10\mu^3 + 30\mu^2 - 26\mu + 5 \neq 0 \vee 6\mu^4 - 56\mu^3 + 157\mu^2 - 130\mu$$
$$+ 23 \neq 0 \vee 9\mu^4 - 78\mu^3 + 205\mu^2 - 162\mu + 26 \neq 0 \vee (-3\mu \leq -5 \wedge ($$
$$-5 + 3\mu \neq 0 \vee -\mu^3 + 10\mu^2 - 30\mu \leq -25))) \wedge (\mu^3 - 10\mu^2 + 30\mu$$
$$- 25 \neq 0 \vee 6\mu^3 - 56\mu^2 + 157\mu - 125 \neq 0 \vee 9\mu^3 - 78\mu^2 + 205\mu - 156$$

$$\neq 0 \vee \mu - 5 \neq 0 \vee 5\,\mu - 23 \neq 0 \vee 3\,\mu - 13 \neq 0)) \vee (-6\,\mu^2 + 19\,\mu$$
$$\leq 15 \wedge (6\,\mu^2 - 19\,\mu + 15 \neq 0 \vee (-\mu^4 + 13\,\mu^3 - 55\,\mu^2 + 90\,\mu \leq 50 \wedge (\mu^4$$
$$- 13\,\mu^3 + 55\,\mu^2 - 90\,\mu + 50 \neq 0 \vee \mu < 5)))))) \wedge (3\,\mu^2 - 13\,\mu + 12 = 0$$
$$\vee -3\,\mu \leq -13 \vee (-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu \leq -24$$
$$\wedge 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0) \vee (-9\,\mu^3 + 78\,\mu^2$$
$$- 205\,\mu \leq -156 \wedge (9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \vee 3\,\mu - 13 \neq 0))$$
$$\vee 3\,\mu < 13) \wedge (\mu^2 - 4\,\mu + 1 = 0 \vee \mu^3 - 6\,\mu^2 + 9\,\mu - 2 = 0 \vee -\mu^3 + 5\,\mu^2$$
$$- 5\,\mu \leq -1 \vee -3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu < 2 \vee (\mu^2 - 3\,\mu \leq -2$$
$$\wedge (\mu^2 - 3\,\mu + 2 \neq 0 \vee \mu^3 - 3\,\mu^2 + 2\,\mu \neq 0)) \vee -2\,\mu^2 + 3\,\mu < 1)$$
$$\wedge ((\mu^2 - 5\,\mu + 5 = 0 \wedge 3\,\mu^2 - 13\,\mu + 12 = 0) \vee (-3\,\mu \leq -13 \wedge (3\,\mu$$
$$- 13 \neq 0 \vee -\mu \leq -5)) \vee (-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu$$
$$\leq -24 \wedge (9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0 \vee (-6\,\mu^5$$
$$+ 56\,\mu^4 - 184\,\mu^3 + 255\,\mu^2 - 143\,\mu \leq -22 \wedge (6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3$$
$$- 255\,\mu^2 + 143\,\mu - 22 \neq 0 \vee -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \leq -5)$$
$$)) \wedge (\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \vee 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3$$
$$- 255\,\mu^2 + 143\,\mu - 22 \neq 0 \vee 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24$$
$$\neq 0)) \vee (-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \leq -156 \wedge (9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156$$
$$\neq 0 \vee (-6\,\mu^3 + 56\,\mu^2 - 157\,\mu \leq -125 \wedge (6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125$$
$$\neq 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25))) \wedge (\mu^3 - 10\,\mu^2 + 30\,\mu - 25 \neq 0$$
$$\vee 6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \neq 0 \vee 9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \vee \mu$$
$$- 5 \neq 0 \vee 5\,\mu - 23 \neq 0 \vee 3\,\mu - 13 \neq 0)) \vee (3\,\mu \leq 13 \wedge (3\,\mu - 13 \neq 0$$
$$\vee (3\,\mu \leq 14 \wedge (3\,\mu - 14 \neq 0 \vee \mu < 5))))) \wedge (\mu^2 - 4\,\mu + 1 = 0 \vee (\mu^2$$
$$- 5\,\mu + 5 = 0 \wedge 3\,\mu^2 - 13\,\mu + 12 = 0) \vee (-\mu^3 + 5\,\mu^2 - 5\,\mu \leq -1 \wedge (\mu^3$$
$$- 5\,\mu^2 + 5\,\mu - 1 \neq 0 \vee -\mu \leq -5)) \vee (-3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu$$
$$\leq 2 \wedge 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2 - 18\,\mu + 2 \neq 0) \vee (\mu^2 - 3\,\mu \leq -2 \wedge (\mu^2$$
$$- 3\,\mu + 2 \neq 0 \vee -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \leq -5) \wedge (\mu^5$$
$$- 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \vee 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2$$
$$+ 143\,\mu - 22 \neq 0 \vee 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0))$$
$$\vee (\mu^2 - 3\,\mu \leq -2 \wedge (\mu^2 - 3\,\mu + 2 \neq 0 \vee (-3\,\mu^5 + 31\,\mu^4 - 116\,\mu^3$$
$$+ 192\,\mu^2 - 137\,\mu \leq -25 \wedge (3\,\mu^5 - 31\,\mu^4 + 116\,\mu^3 - 192\,\mu^2 + 137\,\mu - 25$$
$$\neq 0 \vee -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25))) \wedge (\mu^3 - 10\,\mu^2 + 30\,\mu - 25 \neq 0$$
$$\vee 6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \neq 0 \vee 9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \vee \mu$$
$$- 5 \neq 0 \vee 5\,\mu - 23 \neq 0 \vee 3\,\mu - 13 \neq 0)) \vee (-2\,\mu^2 + 3\,\mu \leq 1 \wedge (2\,\mu^2$$

$$-3\mu + 1 \neq 0 \vee \left(-\mu^4 + 11\mu^3 - 33\mu^2 + 23\mu \leq 4 \wedge \left(\mu^4 - 11\mu^3 + 33\mu^2\right.\right.$$
$$\left.\left.\left.\left.\left. - 23\mu + 4 \neq 0 \vee \mu < 5\right)\right)\right)\right)\right) \wedge \left(\mu^2 - 5\mu + 5 = 0 \vee \left(\mu^2 - 5\mu + 5 = 0\right.\right.$$
$$\left.\left. \wedge 3\mu^2 - 13\mu + 12 = 0\right) \vee \left(-3\mu^3 + 20\mu^2 - 40\mu \leq -25 \wedge \left(3\mu^3 - 20\mu^2\right.\right.\right.$$
$$\left.\left.\left. + 40\mu - 25 \neq 0 \vee -\mu \leq -5\right)\right) \vee \left(-3\mu^4 + 28\mu^3 - 92\mu^2 + 125\mu \leq 60\right.$$
$$\left. \wedge 3\mu^4 - 28\mu^3 + 92\mu^2 - 125\mu + 60 \neq 0\right) \vee \left(-\mu^2 + 3\mu \leq 2 \wedge \left(\mu^2 - 3\mu\right.\right.$$
$$\left.\left. + 2 \neq 0 \vee -\mu^5 + 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \leq -5\right) \wedge \left(\mu^5 - 10\mu^4\right.\right.$$
$$\left.\left. + 35\mu^3 - 51\mu^2 + 30\mu - 5 \neq 0 \vee 6\mu^5 - 56\mu^4 + 184\mu^3 - 255\mu^2 + 143\mu\right.\right.$$
$$\left.\left. - 22 \neq 0 \vee 9\mu^5 - 78\mu^4 + 241\mu^3 - 318\mu^2 + 170\mu - 24 \neq 0\right)\right) \vee \left(-3\mu\right.$$
$$\left. \leq -5 \wedge \left(-5 + 3\mu \neq 0 \vee -\mu^3 + 10\mu^2 - 30\mu \leq -25\right) \wedge \left(\mu^3 - 10\mu^2\right.\right.$$
$$\left.\left. + 30\mu - 25 \neq 0 \vee 6\mu^3 - 56\mu^2 + 157\mu - 125 \neq 0 \vee 9\mu^3 - 78\mu^2 + 205\mu\right.\right.$$
$$\left.\left. - 156 \neq 0 \vee \mu - 5 \neq 0 \vee 5\mu - 23 \neq 0 \vee 3\mu - 13 \neq 0\right)\right) \vee \left(-6\mu^2\right.$$
$$\left. + 19\mu \leq 15 \wedge \left(6\mu^2 - 19\mu + 15 \neq 0 \vee \left(-\mu^4 + 13\mu^3 - 55\mu^2 + 90\mu\right.\right.\right.$$
$$\left.\left.\left. \leq 50 \wedge \left(\mu^4 - 13\mu^3 + 55\mu^2 - 90\mu + 50 \neq 0 \vee \mu < 5\right)\right)\right)\right) \wedge \left(3\mu^2\right.$$
$$\left. - 13\mu + 12 = 0 \vee 3\mu \leq 13 \vee -9\mu^5 + 78\mu^4 - 241\mu^3 + 318\mu^2 - 170\mu\right.$$
$$\left. \leq -24 \vee 3\mu < 13\right) \wedge \left(\left(\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12 = 0\right) \vee \left(3\mu\right.\right.$$
$$\left.\left. \leq 13 \wedge \left(3\mu - 13 \neq 0 \vee \mu \leq 5\right)\right) \vee \left(-9\mu^5 + 78\mu^4 - 241\mu^3 + 318\mu^2\right.\right.$$
$$\left.\left. - 170\mu \leq -24 \wedge \left(9\mu^5 - 78\mu^4 + 241\mu^3 - 318\mu^2 + 170\mu - 24 \neq 0 \vee \left(\right.\right.\right.\right.$$
$$\left. -6\mu^5 + 56\mu^4 - 184\mu^3 + 255\mu^2 - 143\mu \leq -22 \wedge \left(6\mu^5 - 56\mu^4 + 184\mu^3\right.\right.$$
$$\left.\left. - 255\mu^2 + 143\mu - 22 \neq 0 \vee -\mu^5 + 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \leq -5\right)\right.$$
$$\left.\left.\left.\left. \right)\right)\right) \vee \left(3\mu \leq 13 \wedge \left(3\mu - 13 \neq 0 \vee \left(3\mu \leq 14 \wedge \left(3\mu - 14 \neq 0 \vee \mu\right.\right.\right.\right.\right.$$
$$\left.\left.\left.\left.\left. < 5\right)\right)\right)\right)\right) \wedge \left(\mu^2 - 4\mu + 1 = 0 \vee \left(\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12\right.\right.$$
$$\left.\left. = 0\right) \vee \left(\mu^3 - 5\mu^2 + 5\mu \leq 1 \wedge \left(\mu^3 - 5\mu^2 + 5\mu - 1 \neq 0 \vee \mu \leq 5\right)\right) \vee \left(\right.\right.$$
$$\left. -3\mu^4 + 22\mu^3 - 45\mu^2 + 18\mu \leq 2 \wedge 3\mu^4 - 22\mu^3 + 45\mu^2 - 18\mu + 2 \neq 0\right)$$
$$\vee \left(\mu^2 - 3\mu \leq -2 \wedge \left(\mu^2 - 3\mu + 2 \neq 0 \vee -\mu^5 + 10\mu^4 - 35\mu^3 + 51\mu^2\right.\right.$$
$$\left.\left. - 30\mu \leq -5\right)\right) \vee \left(-2\mu^2 + 3\mu \leq 1 \wedge \left(2\mu^2 - 3\mu + 1 \neq 0 \vee \left(-\mu^4\right.\right.\right.$$
$$\left.\left.\left. + 11\mu^3 - 33\mu^2 + 23\mu \leq 4 \wedge \left(\mu^4 - 11\mu^3 + 33\mu^2 - 23\mu + 4 \neq 0 \vee \mu\right.\right.\right.\right.$$
$$\left.\left.\left.\left. < 5\right)\right)\right)\right) \wedge \left(\mu^2 - 5\mu + 5 = 0 \vee \left(\mu^2 - 5\mu + 5 = 0 \wedge 3\mu^2 - 13\mu + 12\right.\right.$$
$$\left.\left. = 0\right) \vee \left(3\mu^3 - 20\mu^2 + 40\mu \leq 25 \wedge \left(3\mu^3 - 20\mu^2 + 40\mu - 25 \neq 0 \vee \mu\right.\right.\right.$$
$$\left.\left.\left. \leq 5\right)\right) \vee \left(-3\mu^4 + 28\mu^3 - 92\mu^2 + 125\mu \leq 60 \wedge 3\mu^4 - 28\mu^3 + 92\mu^2\right.\right.$$
$$\left.\left. - 125\mu + 60 \neq 0\right) \vee \left(-\mu^2 + 3\mu \leq 2 \wedge \left(\mu^2 - 3\mu + 2 \neq 0 \vee -\mu^5\right.\right.\right.$$
$$\left.\left.\left. + 10\mu^4 - 35\mu^3 + 51\mu^2 - 30\mu \leq -5\right)\right) \vee \left(-6\mu^2 + 19\mu \leq 15 \wedge \left(6\mu^2\right.\right.\right.$$
$$\left.\left.\left. - 19\mu + 15 \neq 0 \vee \left(-\mu^4 + 13\mu^3 - 55\mu^2 + 90\mu \leq 50 \wedge \left(\mu^4 - 13\mu^3\right.\right.\right.\right.\right.$$
$$\left.\left.\left.\left.\left. + 55\mu^2 - 90\mu + 50 \neq 0 \vee \mu < 5\right)\right)\right)\right) \wedge \left(3\mu \leq 13 \vee \left(-9\mu^4 + 78\mu^3\right.\right.$$

$$-205\,\mu^2 + 162\,\mu \le 26 \land \big(9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \ne 0 \lor$$
$$-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \le -156\big) \land \big(9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \ne 0 \lor 3\,\mu$$
$$-13 \ne 0\big)\big) \lor 3\,\mu < 13\big) \land \big(\mu^2 - 5\,\mu + 5 = 0 \lor 3\,\mu^3 - 20\,\mu^2 + 40\,\mu \le 25$$
$$\lor -3\,\mu^4 + 28\,\mu^3 - 92\,\mu^2 + 125\,\mu < 60 \lor \big(-3\,\mu^3 + 14\,\mu^2 - 21\,\mu \le -10$$
$$\land 3\,\mu^3 - 14\,\mu^2 + 21\,\mu - 10 \ne 0\big) \lor -6\,\mu^2 + 19\,\mu < 15\big) \land \big(\mu^2 - 4\,\mu + 1$$
$$= 0 \lor \mu^3 - 5\,\mu^2 + 5\,\mu \le 1 \lor -3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu < 2 \lor \big(\mu^2$$
$$-3\,\mu \le -2 \land \big(\mu^2 - 3\,\mu + 2 \ne 0 \lor \mu^3 - 3\,\mu^2 + 2\,\mu \ne 0\big)\big) \lor -2\,\mu^2 + 3\,\mu$$
$$< 1\big) \land \big(\big(3\,\mu \le 13 \land \big(3\,\mu - 13 \ne 0 \lor \mu \le 5\big)\big) \lor \big(-9\,\mu^4 + 78\,\mu^3$$
$$-205\,\mu^2 + 162\,\mu \le 26 \land \big(9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \ne 0 \lor \big($$
$$-6\,\mu^4 + 56\,\mu^3 - 157\,\mu^2 + 130\,\mu \le 23 \land \big(6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2 - 130\,\mu$$
$$+23 \ne 0 \lor -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu \le 5\big)\big)\big) \land \big(\mu^4 - 10\,\mu^3 + 30\,\mu^2$$
$$-26\,\mu + 5 \ne 0 \lor 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2 - 130\,\mu + 23 \ne 0 \lor 9\,\mu^4 - 78\,\mu^3$$
$$+205\,\mu^2 - 162\,\mu + 26 \ne 0 \lor \big(-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \le -156 \land \big(9\,\mu^3$$
$$-78\,\mu^2 + 205\,\mu - 156 \ne 0 \lor \big(-6\,\mu^3 + 56\,\mu^2 - 157\,\mu \le -125 \land \big(6\,\mu^3$$
$$-56\,\mu^2 + 157\,\mu - 125 \ne 0 \lor -\mu^3 + 10\,\mu^2 - 30\,\mu \le -25\big)\big)\big)\big)\big) \land \big(\mu^3$$
$$-10\,\mu^2 + 30\,\mu - 25 \ne 0 \lor 6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \ne 0 \lor 9\,\mu^3 - 78\,\mu^2$$
$$+205\,\mu - 156 \ne 0 \lor \mu - 5 \ne 0 \lor 5\,\mu - 23 \ne 0 \lor 3\,\mu - 13 \ne 0\big)\big) \lor \big(3\,\mu$$
$$\le 13 \land \big(3\,\mu - 13 \ne 0 \lor \big(3\,\mu \le 14 \land \big(3\,\mu - 14 \ne 0 \lor \mu < 5\big)\big)\big)\big)\big)\big)$$
$$\land \big(\mu^2 - 4\,\mu + 1 = 0 \lor \big(\mu^3 - 5\,\mu^2 + 5\,\mu \le 1 \land \big(\mu^3 - 5\,\mu^2 + 5\,\mu - 1 \ne 0$$
$$\lor \mu \le 5\big)\big) \lor \big(-3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu \le 2 \land 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2$$
$$-18\,\mu + 2 \ne 0\big) \lor \big(-\mu^2 + 2\,\mu \le 1 \land \big(\mu^2 - 2\,\mu + 1 \ne 0 \lor -\mu^4 + 10\,\mu^3$$
$$-30\,\mu^2 + 26\,\mu \le 5\big) \land \big(\mu^4 - 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5 \ne 0 \lor 6\,\mu^4 - 56\,\mu^3$$
$$+157\,\mu^2 - 130\,\mu + 23 \ne 0 \lor 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \ne 0$$
$$\lor \big(\mu^2 - 3\,\mu \le -2 \land \big(\mu^2 - 3\,\mu + 2 \ne 0 \lor \big(-3\,\mu^5 + 31\,\mu^4 - 116\,\mu^3$$
$$+192\,\mu^2 - 137\,\mu \le -25 \land \big(3\,\mu^5 - 31\,\mu^4 + 116\,\mu^3 - 192\,\mu^2 + 137\,\mu - 25$$
$$\ne 0 \lor -\mu^3 + 10\,\mu^2 - 30\,\mu \le -25\big)\big)\big)\big)\big) \land \big(\mu^3 - 10\,\mu^2 + 30\,\mu - 25 \ne 0$$
$$\lor 6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \ne 0 \lor 9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \ne 0 \lor \mu$$
$$-5 \ne 0 \lor 5\,\mu - 23 \ne 0 \lor 3\,\mu - 13 \ne 0\big)\big) \lor \big(-2\,\mu^2 + 3\,\mu \le 1 \land \big(2\,\mu^2$$
$$-3\,\mu + 1 \ne 0 \lor \big(-\mu^4 + 11\,\mu^3 - 33\,\mu^2 + 23\,\mu \le 4 \land \big(\mu^4 - 11\,\mu^3 + 33\,\mu^2$$
$$-23\,\mu + 4 \ne 0 \lor \mu < 5\big)\big)\big)\big)\big) \land \big(\mu^2 - 5\,\mu + 5 = 0 \lor \big(3\,\mu^3 - 20\,\mu^2$$
$$+40\,\mu \le 25 \land \big(3\,\mu^3 - 20\,\mu^2 + 40\,\mu - 25 \ne 0 \lor \mu \le 5\big)\big) \lor \big(-3\,\mu^4$$
$$+28\,\mu^3 - 92\,\mu^2 + 125\,\mu \le 60 \land 3\,\mu^4 - 28\,\mu^3 + 92\,\mu^2 - 125\,\mu + 60 \ne 0\big)$$
$$\lor \big(-3\,\mu^3 + 14\,\mu^2 - 21\,\mu \le -10 \land \big(3\,\mu^3 - 14\,\mu^2 + 21\,\mu - 10 \ne 0 \lor \big($$

$-3\,\mu^6 + 34\,\mu^5 - 142\,\mu^4 + 266\,\mu^3 - 210\,\mu^2 + 30\,\mu \le -25 \land \big(3\,\mu^6 - 34\,\mu^5 + 142\,\mu^4 - 266\,\mu^3 + 210\,\mu^2 - 30\,\mu - 25 \neq 0 \lor -\mu^4 + 10\,\mu^3 - 30\,\mu^2 + 26\,\mu \le 5\big)\big)\big) \land \big(\mu^4 - 10\,\mu^3 + 30\,\mu^2 - 26\,\mu + 5 \neq 0 \lor 6\,\mu^4 - 56\,\mu^3 + 157\,\mu^2 - 130\,\mu + 23 \neq 0 \lor 9\,\mu^4 - 78\,\mu^3 + 205\,\mu^2 - 162\,\mu + 26 \neq 0 \lor \big(-3\,\mu \le -5 \land \big(-5 + 3\,\mu \neq 0 \lor -\mu^3 + 10\,\mu^2 - 30\,\mu \le -25\big)\big)\big) \land \big(\mu^3 - 10\,\mu^2 + 30\,\mu - 25 \neq 0 \lor 6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \neq 0 \lor 9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \lor \mu - 5 \neq 0 \lor 5\,\mu - 23 \neq 0 \lor 3\,\mu - 13 \neq 0\big)\big) \lor \big(-6\,\mu^2 + 19\,\mu \le 15 \land \big(6\,\mu^2 - 19\,\mu + 15 \neq 0 \lor \big(-\mu^4 + 13\,\mu^3 - 55\,\mu^2 + 90\,\mu \le 50 \land \big(\mu^4 - 13\,\mu^3 + 55\,\mu^2 - 90\,\mu + 50 \neq 0 \lor \mu < 5\big)\big)\big)\big)\big) \land \big(3\,\mu^2 - 13\,\mu + 12 = 0 \lor 3\,\mu \le 13 \lor \big(-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu \le -24 \land 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0\big) \lor \big(-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \le -156 \land \big(9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \lor 3\,\mu - 13 \neq 0\big)\big) \lor 3\,\mu < 13\big) \land \big(\mu^2 - 4\,\mu + 1 = 0 \lor \mu^3 - 6\,\mu^2 + 9\,\mu - 2 = 0 \lor \mu^3 - 5\,\mu^2 + 5\,\mu \le 1 \lor -3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu < 2 \lor \big(\mu^2 - 3\,\mu \le -2 \land \big(\mu^2 - 3\,\mu + 2 \neq 0 \lor \mu^3 - 3\,\mu^2 + 2\,\mu \neq 0\big)\big) \lor -2\,\mu^2 + 3\,\mu < 1\big)$

$\land \big(\big(\mu^2 - 5\,\mu + 5 = 0 \land 3\,\mu^2 - 13\,\mu + 12 = 0\big) \lor \big(3\,\mu \le 13 \land \big(3\,\mu - 13 \neq 0 \lor \mu \le 5\big)\big) \lor \big(-9\,\mu^5 + 78\,\mu^4 - 241\,\mu^3 + 318\,\mu^2 - 170\,\mu \le -24 \land \big(9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0 \lor \big(-6\,\mu^5 + 56\,\mu^4 - 184\,\mu^3 + 255\,\mu^2 - 143\,\mu \le -22 \land \big(6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \lor -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \le -5\big)\big)\big) \land \big(\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \lor 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \lor 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0\big)\big) \lor \big(-9\,\mu^3 + 78\,\mu^2 - 205\,\mu \le -156 \land \big(9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \lor \big(-6\,\mu^3 + 56\,\mu^2 - 157\,\mu \le -125 \land \big(6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \neq 0 \lor -\mu^3 + 10\,\mu^2 - 30\,\mu \le -25\big)\big)\big) \land \big(\mu^3 - 10\,\mu^2 + 30\,\mu - 25 \neq 0 \lor 6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \neq 0 \lor 9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \lor \mu - 5 \neq 0 \lor 5\,\mu - 23 \neq 0 \lor 3\,\mu - 13 \neq 0\big)\big) \lor \big(3\,\mu \le 13 \land \big(3\,\mu - 13 \neq 0 \lor \big(3\,\mu \le 14 \land \big(3\,\mu - 14 \neq 0 \lor \mu < 5\big)\big)\big)\big)\big)\big) \land \big(\mu^2 - 4\,\mu + 1 = 0 \lor \big(\mu^2 - 5\,\mu + 5 = 0 \land 3\,\mu^2 - 13\,\mu + 12 = 0\big) \lor \big(\mu^3 - 5\,\mu^2 + 5\,\mu \le 1 \land \big(\mu^3 - 5\,\mu^2 + 5\,\mu - 1 \neq 0 \lor \mu \le 5\big)\big) \lor \big(-3\,\mu^4 + 22\,\mu^3 - 45\,\mu^2 + 18\,\mu \le 2 \land 3\,\mu^4 - 22\,\mu^3 + 45\,\mu^2 - 18\,\mu + 2 \neq 0\big) \lor \big(\mu^2 - 3\,\mu \le -2 \land \big(\mu^2 - 3\,\mu + 2 \neq 0 \lor -\mu^5 + 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \le -5\big) \land \big(\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2 + 30\,\mu - 5 \neq 0 \lor 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22$

$$\neq 0 \lor 9\,\mu^5 - 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0)) \lor (\mu^2 - 3\,\mu$$
$$\leq -2 \land (\mu^2 - 3\,\mu + 2 \neq 0 \lor (-3\,\mu^5 + 31\,\mu^4 - 116\,\mu^3 + 192\,\mu^2 - 137\,\mu$$
$$\leq -25 \land (3\,\mu^5 - 31\,\mu^4 + 116\,\mu^3 - 192\,\mu^2 + 137\,\mu - 25 \neq 0 \lor -\mu^3$$
$$+ 10\,\mu^2 - 30\,\mu \leq -25))) \land (\mu^3 - 10\,\mu^2 + 30\,\mu - 25 \neq 0 \lor 6\,\mu^3 - 56\,\mu^2$$
$$+ 157\,\mu - 125 \neq 0 \lor 9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \lor \mu - 5 \neq 0 \lor 5\,\mu$$
$$- 23 \neq 0 \lor 3\,\mu - 13 \neq 0)) \lor (-2\,\mu^2 + 3\,\mu \leq 1 \land (2\,\mu^2 - 3\,\mu + 1 \neq 0$$
$$\lor (-\mu^4 + 11\,\mu^3 - 33\,\mu^2 + 23\,\mu \leq 4 \land (\mu^4 - 11\,\mu^3 + 33\,\mu^2 - 23\,\mu + 4 \neq 0$$
$$\lor \mu < 5)))))) \land (\mu^2 - 5\,\mu + 5 = 0 \lor (\mu^2 - 5\,\mu + 5 = 0 \land 3\,\mu^2 - 13\,\mu$$
$$+ 12 = 0) \lor (3\,\mu^3 - 20\,\mu^2 + 40\,\mu \leq 25 \land (3\,\mu^3 - 20\,\mu^2 + 40\,\mu - 25 \neq 0$$
$$\lor \mu \leq 5)) \lor (-3\,\mu^4 + 28\,\mu^3 - 92\,\mu^2 + 125\,\mu \leq 60 \land 3\,\mu^4 - 28\,\mu^3 + 92\,\mu^2$$
$$- 125\,\mu + 60 \neq 0) \lor (-\mu^2 + 3\,\mu \leq 2 \land (\mu^2 - 3\,\mu + 2 \neq 0 \lor -\mu^5$$
$$+ 10\,\mu^4 - 35\,\mu^3 + 51\,\mu^2 - 30\,\mu \leq -5) \land (\mu^5 - 10\,\mu^4 + 35\,\mu^3 - 51\,\mu^2$$
$$+ 30\,\mu - 5 \neq 0 \lor 6\,\mu^5 - 56\,\mu^4 + 184\,\mu^3 - 255\,\mu^2 + 143\,\mu - 22 \neq 0 \lor 9\,\mu^5$$
$$- 78\,\mu^4 + 241\,\mu^3 - 318\,\mu^2 + 170\,\mu - 24 \neq 0)) \lor (-3\,\mu \leq -5 \land (-5$$
$$+ 3\,\mu \neq 0 \lor -\mu^3 + 10\,\mu^2 - 30\,\mu \leq -25) \land (\mu^3 - 10\,\mu^2 + 30\,\mu - 25 \neq 0$$
$$\lor 6\,\mu^3 - 56\,\mu^2 + 157\,\mu - 125 \neq 0 \lor 9\,\mu^3 - 78\,\mu^2 + 205\,\mu - 156 \neq 0 \lor \mu$$
$$- 5 \neq 0 \lor 5\,\mu - 23 \neq 0 \lor 3\,\mu - 13 \neq 0)) \lor (-6\,\mu^2 + 19\,\mu \leq 15 \land (6\,\mu^2$$
$$- 19\,\mu + 15 \neq 0 \lor (-\mu^4 + 13\,\mu^3 - 55\,\mu^2 + 90\,\mu \leq 50 \land (\mu^4 - 13\,\mu^3$$
$$+ 55\,\mu^2 - 90\,\mu + 50 \neq 0 \lor \mu < 5)))))$$

```
> elim2:=eval(elim,[And=`and`,Or=`or`]):
> pp:=proc(mm) if eval(elim2,mu=mm) then 1 else 0 fi end:
> plot(pp,0..5);
```
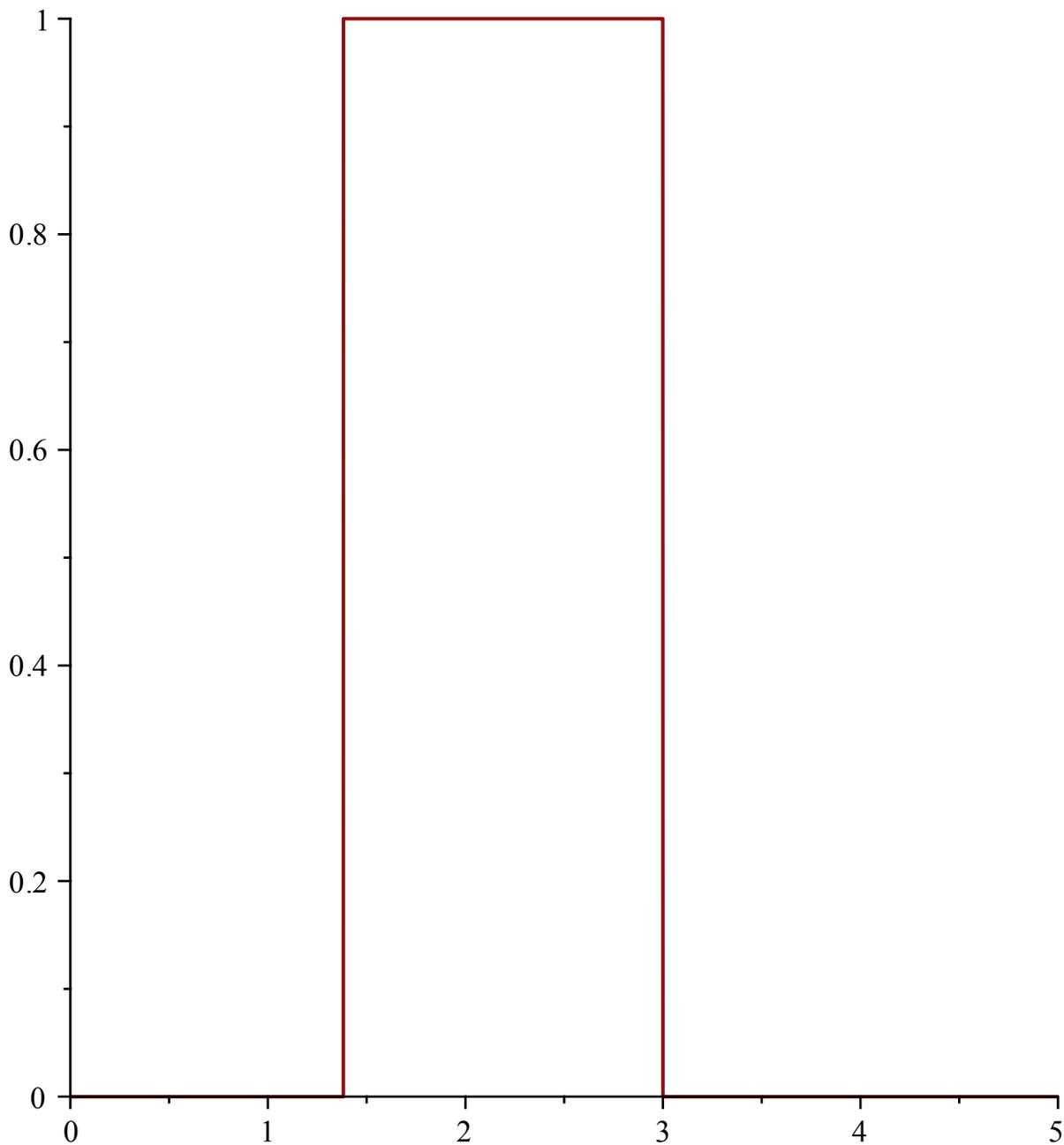
This shows that any value of μ in the interval between roughly 1.4 and 3 would work (the actual values are algebraic numbers that can be extracted from the formula above).

▼ Recurrence in action

The aim is to show that the sequence defined by

```
> rec:=(16*n+1)*u(n+3)-(32*n-2)*u(n+2)+(20*n-4)*u(n+1)-(5*n-3)*u
  (n)=0;
```

$$rec := (16\,n + 1)\,u(n + 3) - (32\,n - 2)\,u(n + 2) + (20\,n - 4)\,u(n + 1) - (5\,n \qquad \text{(4.1)}$$
$$- 3)\,u(n) = 0$$

and

```
> ini:={u(0)=5,u(1)=5,u(2)=1};
```

$$ini := \{u(0) = 5, u(1) = 5, u(2) = 1\} \qquad \text{(4.2)}$$

is >0 for all n.

```
> with(LinearAlgebra):
```

Check the first values

```
> N:=20:
> L:=gfun:-rectoproc({rec,op(ini)},u(n),list)(N);
```

$$L := \left[5, 5, 1, 3, \frac{84}{17}, \frac{3491}{561}, \frac{193118}{27489}, \frac{389756}{51051}, \frac{79660582}{9648639}, \frac{765516302}{85083453}, \right.$$

$$\frac{1047161107676}{105758732079}, \frac{116430530626}{10600525593}, \frac{734444332400872}{59945972228415},$$

$$\frac{1456409614649458996}{1061643168165229965}, \frac{41346669999908131424}{2684440582360652115},$$

$$\frac{6284662466466527841632}{362667922769241007365}, \frac{1480315806013768902348876}{757975958394771370539285},$$

$$\frac{25061081947310862736486352}{113696393759215705580899275}, \frac{6825169004044283124539816585}{274008308959709850449951527},$$

$$\left. \frac{19843[...22 \text{ digits}...]07128}{70420135402645431565637542675}, \frac{18588[...23 \text{ digits}...]31504}{58256[...21 \text{ digits}...]39675} \right]$$

(4.1.1)

```
> evalf(%);
```

$[5., 5., 1., 3., 4.941176471, 6.222816399, 7.025282840, 7.634639870, 8.256147007,$ **(4.1.2)**

$8.997240650, 9.901415109, 10.98346772, 12.25177114, 13.71844758,$

$15.40234128, 17.32897252, 19.52985170, 22.04210804, 24.90862058,$

$28.17855618, 31.90818239]$

looks good.

Animation

```
norm2:=proc(L) local j; sqrt(add(j^2,j=L)) end:
direction:=proc(L) local j,n:=norm2(L); [seq(j/n,j=L)] end:
makecone:=proc(param,t,length::numeric:=.65,npt::integer:=50,V::list(numeric):=[1,1,1])
local base,sc,i;
    base:=evalc(param);
    sc:=add(V[i]*base[i],i=1..3);
    base:=[seq(length/sc*base[i],i=1..3)];
    plots[polygonplot3d]([[0$3],seq(eval(base,t=2*Pi*i/npt),i=0..npt)],style=surface)
end:
```

The intersection of a sphere with R^3_{>0}:

```
> sph:=plot3d(.6,0..Pi/2,0..Pi/2,coords=spherical,color=
  aquamarine,style=patchnogrid):
```

The directions of the vectors constructed from successive triples of elements of the sequences

```
> WW:=[sph,seq(plottools:-line([0$3],direction(L[i..i+2]),
  color=red,thickness=3),i=1..N-2)]:
> WW2:=[seq(plots[display]([seq(WW[j],j=1..i)]),i=1..nops(WW))
  ]:
> opts:=axes=normal,view=[(-0.25..1)$3],tickmarks=[0$3],
  orientation=[-14,76,-6]:
```
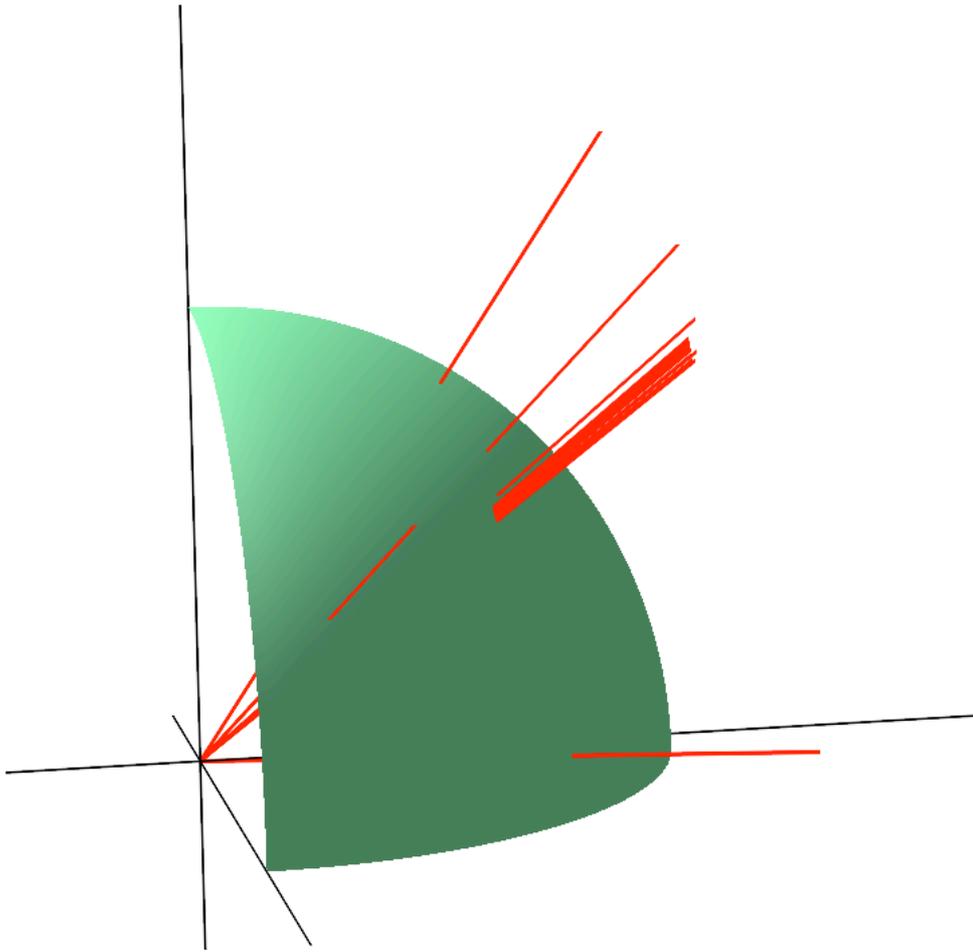
Animation:

```
> #plots[display](WW2,insequence=true,opts);
```

Final picture:

```
> plots[display](WW2[-1],opts);
```

End of the proof of positivity tomorrow