# OpenGeoProver Output for conjecture "Chou 336 (Gergonne's point theorem)"

Wu's method used

February 23, 2012

## 1 Validation of Construction Protocol

### Construction steps:

- Free point P
- Free point Q
- Free point R
- Circumscribed circle k around triangle PQR
- Tangent line a through point P of set of points k
- Tangent line b through point R of set of points k
- Tangent line c through point Q of set of points k
- Intersection point A of point sets b and c
- Intersection point B of point sets a and c
- Intersection point C of point sets a and b
- Line ap through two points A and P
- Line br through two points B and R
- Intersection point G of point sets ap and br

### Theorem statement:

- Points C, Q, G are collinear

**Validation result:** Construction protocol is valid.

# 2 Transformation of Construction Protocol to algebraic form

## Transformation of Construction steps

### 2.1 Transformation of point P:

- Point P has been assigned following coordinates: (0, 0)

### 2.2 Transformation of point Q:

- Point Q has been assigned following coordinates: (0, $u_1$)

### 2.3 Transformation of point R:

- Point R has been assigned following coordinates: ($u_2$, $u_3$)

### 2.4 Transformation of point A:

- Point A has been assigned following coordinates: ($x_1$, $x_2$)
- Polynomial that point A has to satisfy is:

$$\begin{aligned} p &= (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\ &\quad (-0.5u_3^2u_2 - 0.5u_2^3) \end{aligned}$$

- Processing of polynomial

$$\begin{aligned} p &= (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\ &\quad (-0.5u_3^2u_2 - 0.5u_2^3) \end{aligned}$$

**Info:** Polynomial

$$\begin{aligned} p &= (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\ &\quad (-0.5u_3^2u_2 - 0.5u_2^3) \end{aligned}$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses
- Polynomial that point A has to satisfy is:

$$p = u_2u_1x_2 + (-u_3^2 + u_3u_1 - u_2^2)x_1 - u_2u_1^2$$

- Processing of polynomial

$$p = u_2u_1x_2 + (-u_3^2 + u_3u_1 - u_2^2)x_1 - u_2u_1^2$$

**Info:** Polynomial

$$p = u_2u_1x_2 + (-u_3^2 + u_3u_1 - u_2^2)x_1 - u_2u_1^2$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses

## 2.5 Transformation of point B:

- Point B has been assigned following coordinates: $(x_3, x_4)$
- Polynomial that point B has to satisfy is:

$$p = u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3$$

- Processing of polynomial

$$p = u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3$$

**Info:** Polynomial

$$p = u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses
- Polynomial that point B has to satisfy is:

$$p = u_2u_1x_4 + (-u_3^2 + u_3u_1 - u_2^2)x_3 - u_2u_1^2$$

- Processing of polynomial

$$p = u_2u_1x_4 + (-u_3^2 + u_3u_1 - u_2^2)x_3 - u_2u_1^2$$

**Info:** Polynomial

$$p = u_2u_1x_4 + (-u_3^2 + u_3u_1 - u_2^2)x_3 - u_2u_1^2$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses

## 2.6 Transformation of point C:

- Point C has been assigned following coordinates: $(x_5, x_6)$
- Polynomial that point C has to satisfy is:

$$p = u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5$$

- Processing of polynomial

$$p = u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5$$

**Info:** Polynomial

$$p = u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses

- Polynomial that point C has to satisfy is:

$$p = (u_3u_2 - 0.5u_2u_1)x_6 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_5 + (-0.5u_3^2u_2 - 0.5u_2^3)$$

- Processing of polynomial

$$p = (u_3u_2 - 0.5u_2u_1)x_6 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_5 + (-0.5u_3^2u_2 - 0.5u_2^3)$$

**Info:** Polynomial

$$p = (u_3u_2 - 0.5u_2u_1)x_6 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_5 + (-0.5u_3^2u_2 - 0.5u_2^3)$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses

## 2.7 Transformation of point G:

- Point G has been assigned following coordinates: $(x_7, x_8)$
- Polynomial that point G has to satisfy is:

$$p = x_8x_1 - x_7x_2$$

- Processing of polynomial

$$p = x_8x_1 - x_7x_2$$

**Info:** Polynomial

$$p = x_8x_1 - x_7x_2$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses
- Polynomial that point G has to satisfy is:

$$p = x_8x_3 - u_2x_8 - x_7x_4 + u_3x_7 + u_2x_4 - u_3x_3$$

- Processing of polynomial

$$p = x_8x_3 - u_2x_8 - x_7x_4 + u_3x_7 + u_2x_4 - u_3x_3$$

**Info:** Polynomial

$$p = x_8x_3 - u_2x_8 - x_7x_4 + u_3x_7 + u_2x_4 - u_3x_3$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses

### Transformation of Theorem statement

- Polynomial for theorem statement:

$$p = x_8x_5 - x_7x_6 + u_1x_7 - u_1x_5$$

### Time spent for transformation of Construction Protocol to algebraic form

- 0.324 seconds

# 3 Invoking the theorem prover

The used proving method is Wu's method.

The input system is:

$$\begin{aligned}
p_1 &= (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\
&\quad (-0.5u_3^2u_2 - 0.5u_2^3) \\
p_2 &= u_2u_1x_2 + (-u_3^2 + u_3u_1 - u_2^2)x_1 - u_2u_1^2 \\
p_3 &= u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3 \\
p_4 &= u_2u_1x_4 + (-u_3^2 + u_3u_1 - u_2^2)x_3 - u_2u_1^2 \\
p_5 &= u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5 \\
p_6 &= (u_3u_2 - 0.5u_2u_1)x_6 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_5 + \\
&\quad (-0.5u_3^2u_2 - 0.5u_2^3) \\
p_7 &= x_8x_1 - x_7x_2 \\
p_8 &= x_8x_3 - u_2x_8 - x_7x_4 + u_3x_7 + u_2x_4 - u_3x_3
\end{aligned}$$

## 3.1 Triangulation, step 1

**Choosing variable:** Trying the variable with index 8.

**Variable $x_8$ selected:** The number of polynomials with this variable, with indexes from 1 to 8, is 2.

**Minimal degrees:** 2 polynomial(s) with degree 1.

**Polynomial with linear degree:** Removing variable $x_8$ from all other polynomials by reducing them with polynomial $p_7$ from previous step.

Finished a triangulation step, the current system is:

$$\begin{aligned}
p_1 &= (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\
&\quad (-0.5u_3^2u_2 - 0.5u_2^3) \\
p_2 &= u_2u_1x_2 + (-u_3^2 + u_3u_1 - u_2^2)x_1 - u_2u_1^2 \\
p_3 &= u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3 \\
p_4 &= u_2u_1x_4 + (-u_3^2 + u_3u_1 - u_2^2)x_3 - u_2u_1^2
\end{aligned}$$

$$
\begin{aligned}
p_5 &= u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5 \\
p_6 &= (u_3u_2 - 0.5u_2u_1)x_6 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_5 + \\
&\quad (-0.5u_3^2u_2 - 0.5u_2^3) \\
p_7 &= -x_7x_4x_1 + x_7x_3x_2 - u_2x_7x_2 + u_3x_7x_1 + u_2x_4x_1 \\
&\quad -u_3x_3x_1 \\
p_8 &= x_8x_1 - x_7x_2
\end{aligned}
$$

### 3.2 Triangulation, step 2

**Choosing variable:** Trying the variable with index 7.

**Variable $x_7$ selected:** The number of polynomials with this variable, with indexes from 1 to 7, is 1.

**Single polynomial with chosen variable:** Chosen polynomial is $p_7$. No reduction needed.

The triangular system has not been changed.

### 3.3 Triangulation, step 3

**Choosing variable:** Trying the variable with index 6.

**Variable $x_6$ selected:** The number of polynomials with this variable, with indexes from 1 to 6, is 2.

**Minimal degrees:** 2 polynomial(s) with degree 1.

**Polynomial with linear degree:** Removing variable $x_6$ from all other polynomials by reducing them with polynomial $p_5$ from previous step.

Finished a triangulation step, the current system is:

$$
\begin{aligned}
p_1 &= (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\
&\quad (-0.5u_3^2u_2 - 0.5u_2^3) \\
p_2 &= u_2u_1x_2 + (-u_3^2 + u_3u_1 - u_2^2)x_1 - u_2u_1^2 \\
p_3 &= u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3 \\
p_4 &= u_2u_1x_4 + (-u_3^2 + u_3u_1 - u_2^2)x_3 - u_2u_1^2 \\
p_5 &= (-u_3^3u_2 + u_3^2u_2u_1 - u_3u_2^3 + u_2^3u_1)x_5 + \\
&\quad (-0.5u_3^2u_2^2u_1 - 0.5u_2^4u_1) \\
p_6 &= u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5 \\
p_7 &= -x_7x_4x_1 + x_7x_3x_2 - u_2x_7x_2 + u_3x_7x_1 + u_2x_4x_1 \\
&\quad -u_3x_3x_1 \\
p_8 &= x_8x_1 - x_7x_2
\end{aligned}
$$

## 3.4 Triangulation, step 4

**Choosing variable:** Trying the variable with index 5.

**Variable $x_5$ selected:** The number of polynomials with this variable, with indexes from 1 to 5, is 1.

**Single polynomial with chosen variable:** Chosen polynomial is $p_5$. No reduction needed.

The triangular system has not been changed.

## 3.5 Triangulation, step 5

**Choosing variable:** Trying the variable with index 4.

**Variable $x_4$ selected:** The number of polynomials with this variable, with indexes from 1 to 4, is 2.

**Minimal degrees:** 2 polynomial(s) with degree 1.

**Polynomial with linear degree:** Removing variable $x_4$ from all other polynomials by reducing them with polynomial $p_3$ from previous step.

Finished a triangulation step, the current system is:

$$
\begin{aligned}
p_1 &= (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\
&\quad (-0.5u_3^2u_2 - 0.5u_2^3) \\
p_2 &= u_2u_1x_2 + (-u_3^2 + u_3u_1 - u_2^2)x_1 - u_2u_1^2 \\
p_3 &= (-2u_3^2u_2u_1 + 2u_3u_2u_1^2 - 2u_2^3u_1)x_3 - u_2^2u_1^3 \\
p_4 &= u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3 \\
p_5 &= (-u_3^3u_2 + u_3^2u_2u_1 - u_3u_2^3 + u_2^3u_1)x_5 + \\
&\quad (-0.5u_3^2u_2^2u_1 - 0.5u_2^4u_1) \\
p_6 &= u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5 \\
p_7 &= -x_7x_4x_1 + x_7x_3x_2 - u_2x_7x_2 + u_3x_7x_1 + u_2x_4x_1 \\
&\quad -u_3x_3x_1 \\
p_8 &= x_8x_1 - x_7x_2
\end{aligned}
$$

## 3.6 Triangulation, step 6

**Choosing variable:** Trying the variable with index 3.

**Variable $x_3$ selected:** The number of polynomials with this variable, with indexes from 1 to 3, is 1.

**Single polynomial with chosen variable:** Chosen polynomial is $p_3$. No reduction needed.

The triangular system has not been changed.

## 3.7 Triangulation, step 7

**Choosing variable:** Trying the variable with index 2.

**Variable $x_2$ selected:** The number of polynomials with this variable, with indexes from 1 to 2, is 2.

**Minimal degrees:** 2 polynomial(s) with degree 1.

**Polynomial with linear degree:** Removing variable $x_2$ from all other polynomials by reducing them with polynomial $p_1$ from previous step.

Finished a triangulation step, the current system is:

$$
\begin{array}{rcl}
p_1 & = & (-u_3^3u_2 + 2u_3^2u_2u_1 - u_3u_2^3 - u_3u_2u_1^2)x_1 + \\
& & (0.5u_3^2u_2^2u_1 - u_3u_2^2u_1^2 + 0.5u_2^4u_1 + 0.5u_2^2u_1^3) \\
& & \\
p_2 & = & (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\
& & (-0.5u_3^2u_2 - 0.5u_2^3) \\
p_3 & = & (-2u_3^2u_2u_1 + 2u_3u_2u_1^2 - 2u_2^3u_1)x_3 - u_2^2u_1^3 \\
p_4 & = & u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3 \\
p_5 & = & (-u_3^3u_2 + u_3^2u_2u_1 - u_3u_2^3 + u_2^3u_1)x_5 + \\
& & (-0.5u_3^2u_2^2u_1 - 0.5u_2^4u_1) \\
p_6 & = & u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5 \\
p_7 & = & -x_7x_4x_1 + x_7x_3x_2 - u_2x_7x_2 + u_3x_7x_1 + u_2x_4x_1 \\
& & -u_3x_3x_1 \\
p_8 & = & x_8x_1 - x_7x_2
\end{array}
$$

## 3.8 Triangulation, step 8

**Choosing variable:** Trying the variable with index 1.

**Variable $x_1$ selected:** The number of polynomials with this variable, with indexes from 1 to 1, is 1.

**Single polynomial with chosen variable:** Chosen polynomial is $p_1$. No reduction needed.

The triangular system has not been changed.

The triangular system is:

$$
\begin{array}{rcl}
p_1 & = & (-u_3^3u_2 + 2u_3^2u_2u_1 - u_3u_2^3 - u_3u_2u_1^2)x_1 + \\
& & (0.5u_3^2u_2^2u_1 - u_3u_2^2u_1^2 + 0.5u_2^4u_1 + 0.5u_2^2u_1^3) \\
& & \\
p_2 & = & (u_3u_2 - 0.5u_2u_1)x_2 + (-0.5u_3^2 + 0.5u_3u_1 + 0.5u_2^2)x_1 + \\
& & (-0.5u_3^2u_2 - 0.5u_2^3)
\end{array}
$$

$$
\begin{aligned}
p_3 &= (-2u_3^2u_2u_1 + 2u_3u_2u_1^2 - 2u_2^3u_1)x_3 - u_2^2u_1^3 \\
p_4 &= u_2u_1x_4 + (u_3^2 - u_3u_1 + u_2^2)x_3 \\
p_5 &= (-u_3^3u_2 + u_3^2u_2u_1 - u_3u_2^3 + u_2^3u_1)x_5 + \\
&\quad (-0.5u_3^2u_2^2u_1 - 0.5u_2^4u_1) \\
p_6 &= u_2u_1x_6 + (u_3^2 - u_3u_1 + u_2^2)x_5 \\
p_7 &= -x_7x_4x_1 + x_7x_3x_2 - u_2x_7x_2 + u_3x_7x_1 + u_2x_4x_1 \\
&\quad -u_3x_3x_1 \\
p_8 &= x_8x_1 - x_7x_2
\end{aligned}
$$

# 4 Final Remainder

## 4.1 Final remainder for conjecture Chou 336 (Gergonne's point theorem)

Calculating final remainder of the conclusion:

$$g = x_8x_5 - x_7x_6 + u_1x_7 - u_1x_5$$

with respect to the triangular system.

1. Pseudo remainder with $p_8$ over variable $x_8$:

$$g = -x_7x_6x_1 + x_7x_5x_2 + u_1x_7x_1 - u_1x_5x_1$$

2. Pseudo remainder with $p_7$ over variable $x_7$:

$$
\begin{aligned}
g = \; & u_2x_6x_4x_1^2 - u_3x_6x_3x_1^2 - u_2x_5x_4x_2x_1 + \\
& u_1x_5x_4x_1^2 + (u_3 - u_1)x_5x_3x_2x_1 + u_2u_1x_5x_2x_1 \\
& -u_3u_1x_5x_1^2 - u_2u_1x_4x_1^2 + u_3u_1x_3x_1^2
\end{aligned}
$$

3. Pseudo remainder with $p_6$ over variable $x_6$:

$$
\begin{aligned}
g = \; & -u_2^2u_1x_5x_4x_2x_1 + \\
& (-u_3^2u_2 + u_3u_2u_1 - u_2^3 + u_2u_1^2)x_5x_4x_1^2 + \\
& (u_3u_2u_1 - u_2u_1^2)x_5x_3x_2x_1 + \\
& (u_3^3 - u_3^2u_1 + u_3u_2^2)x_5x_3x_1^2 + \\
& u_2^2u_1^2x_5x_2x_1 - u_3u_2u_1^2x_5x_1^2 \\
& -u_2^2u_1^2x_4x_1^2 + u_3u_2u_1^2x_3x_1^2
\end{aligned}
$$

4. Pseudo remainder with $p_5$ over variable $x_5$:

$$
\begin{aligned}
g \;=\; & (-0.5u_3^2u_2^4u_1^2 - 0.5u_2^6u_1^2)x_4x_2x_1 + \\
& (-0.5u_3^4u_2^3u_1 + 1.5u_3^3u_2^3u_1^2 - u_3^2u_2^5u_1 \\
& -0.5u_3^2u_2^3u_1^3 + 1.5u_3u_2^5u_1^2 - 0.5u_2^7u_1 \\
& -0.5u_2^5u_1^3) \\
& x_4x_1^2 \\
& + \\
& (0.5u_3^3u_2^3u_1^2 - 0.5u_3^2u_2^3u_1^3 + 0.5u_3u_2^5u_1^2 \\
& -0.5u_2^5u_1^3) \\
& x_3x_2x_1 \\
& + \\
& (0.5u_3^5u_2^2u_1 - 1.5u_3^4u_2^2u_1^2 + u_3^3u_2^4u_1 + \\
& u_3^3u_2^2u_1^3 - 1.5u_3^2u_2^4u_1^2 + 0.5u_3u_2^6u_1 + \\
& u_3u_2^4u_1^3) \\
& x_3x_1^2 \\
& +(0.5u_3^2u_2^4u_1^3 + 0.5u_2^6u_1^3)x_2x_1 + \\
& (-0.5u_3^3u_2^3u_1^3 - 0.5u_3u_2^5u_1^3)x_1^2
\end{aligned}
$$

5. Pseudo remainder with $p_4$ over variable $x_4$:

$$
\begin{aligned}
g \;=\; & (0.5u_3^4u_2^4u_1^2 + u_3^2u_2^6u_1^2 - 0.5u_3^2u_2^4u_1^4 + \\
& 0.5u_2^8u_1^2 - 0.5u_2^6u_1^4) \\
& x_3x_2x_1 \\
& + \\
& (0.5u_3^6u_2^3u_1 - 1.5u_3^5u_2^3u_1^2 + 1.5u_3^4u_2^5u_1 + \\
& 0.5u_3^4u_2^3u_1^3 - 3u_3^3u_2^5u_1^2 + 0.5u_3^3u_2^3u_1^4 + \\
& 1.5u_3^2u_2^7u_1 + u_3^2u_2^5u_1^3 - 1.5u_3u_2^7u_1^2 + \\
& 0.5u_3u_2^5u_1^4 + 0.5u_2^9u_1 + 0.5u_2^7u_1^3) \\
& x_3x_1^2 \\
& +(0.5u_3^2u_2^5u_1^4 + 0.5u_2^7u_1^4)x_2x_1 + \\
& (-0.5u_3^3u_2^4u_1^4 - 0.5u_3u_2^6u_1^4)x_1^2
\end{aligned}
$$

6. Pseudo remainder with $p_3$ over variable $x_3$:

$$
\begin{aligned}
g \;=\; & (-0.5u_3^4u_2^6u_1^5 + u_3^3u_2^6u_1^6 - u_3^2u_2^8u_1^5 \\
& -0.5u_3^2u_2^6u_1^7 + u_3u_2^8u_1^6 - 0.5u_2^{10}u_1^5 \\
& -0.5u_2^8u_1^7) \\
& x_2x_1 \\
& +
\end{aligned}
$$

$$(0.5u_3^6u_2^5u_1^4 - 0.5u_3^5u_2^5u_1^5 +$$
$$1.5u_3^4u_2^7u_1^4 - 0.5u_3^4u_2^5u_1^6 - u_3^3u_2^7u_1^5 +$$
$$0.5u_3^3u_2^5u_1^7 + 1.5u_3^2u_2^9u_1^4 - 0.5u_3u_2^9u_1^5 +$$
$$0.5u_3u_2^7u_1^7 + 0.5u_2^{11}u_1^4 + 0.5u_2^9u_1^6)$$
$$x_1^2$$

7. Pseudo remainder with $p_2$ over variable $x_2$:

$$\begin{aligned} g \quad = \quad & (0.5u_3^7u_2^6u_1^4 - u_3^6u_2^6u_1^5 + 1.5u_3^5u_2^8u_1^4 + \\ & 0.5u_3^5u_2^6u_1^6 - 2u_3^4u_2^8u_1^5 + 1.5u_3^3u_2^{10}u_1^4 + \\ & u_3^3u_2^8u_1^6 - u_3^2u_2^{10}u_1^5 + 0.5u_3u_2^{12}u_1^4 + \\ & 0.5u_3u_2^{10}u_1^6) \\ & x_1^2 \\ & + \\ & (-0.25u_3^6u_2^7u_1^5 + 0.5u_3^5u_2^7u_1^6 \\ & -0.75u_3^4u_2^9u_1^5 - 0.25u_3^4u_2^7u_1^7 + \\ & u_3^3u_2^9u_1^6 - 0.75u_3^2u_2^{11}u_1^5 \\ & -0.5u_3^2u_2^9u_1^7 + 0.5u_3u_2^{11}u_1^6 - 0.25u_2^{13}u_1^5 \\ & -0.25u_2^{11}u_1^7) \\ & x_1 \end{aligned}$$

8. Pseudo remainder with $p_1$ over variable $x_1$:

$$g \quad = \quad 0$$

# 5 Prover results

**Status:** Theorem has been proved.

**Space Complexity:** The biggest polynomial obtained during prover execution contains 9 terms.

**Time Complexity:** Time spent by the prover is 0.089 seconds.

# 6 NDG Conditions

## NDG Conditions in readable form

- Points Q, P and R are not collinear
- Points Q, P and R are not collinear
- Points Q, P and R are not collinear
- Points Q, P and R are not collinear

- Points Q and P are not identical
- Points Q, P and R are not collinear
- Points Q, P and R are not collinear
- Line through points P and A is not parallel with line through points B and R
- Points P and A are not identical

## Time spent for processing NDG Conditions

- 1.025 seconds