

Minimal Constraint Subsets Detected for differential trail in Table 9 DDH21+
SKINNY-128-384

the 0 th Minimal Constraint set is:

$$\begin{aligned}
&[y^{1_1}] + y^{1_{11}} + [y^{1_{14}}] + x^{2_1} + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} = 0 \\
&[y^{1_1}] + y^{1_{11}} + [x^{2_{13}}] + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} = 0 \\
&y^{2_1} + x^{3_5} + k_{1_7} + k_{2_{7_1}} + k_{3_{7_1}} = 0 \\
&[y^{3_0}] + [y^{3_{10}}] + [y^{3_{13}}] + x^{4_0} + k_{1_{15}} + k_{2_{15_1}} + k_{3_{15_1}} = 0 \\
&y^{3_2} + y^{3_8} + [y^{3_{15}}] + [x^{4_2}] + k_{1_9} + k_{2_{9_1}} + k_{3_{9_1}} = 0 \\
&y^{3_2} + x^{4_6} + k_{1_9} + k_{2_{9_1}} + k_{3_{9_1}} = 0 \\
&y^{3_5} + y^{3_8} + x^{4_{10}} + k_{1_{12}} + k_{2_{12_1}} + k_{3_{12_1}} = 0 \\
&y^{4_0} + x^{5_4} + k_{1_7} + k_{2_{7_2}} + k_{3_{7_2}} = 0 \\
&[y^{4_1}] + [y^{4_{11}}] + x^{5_{13}} + k_{1_3} + k_{2_{3_2}} + k_{3_{3_2}} = 0 \\
&[y^{4_3}] + y^{4_9} + [x^{5_{15}}] + k_{1_6} + k_{2_{6_2}} + k_{3_{6_2}} = 0 \\
&[y^{4_4}] + [y^{4_{11}}] + x^{5_9} + k_{1_0} + k_{2_{0_2}} + k_{3_{0_2}} = 0 \\
&y^{4_6} + y^{4_9} + x^{5_{11}} + k_{1_2} + k_{2_{2_2}} + k_{3_{2_2}} = 0 \\
&[y^{4_7}] + y^{4_{10}} + [x^{5_8}] + k_{1_5} + k_{2_{5_2}} + k_{3_{5_2}} = 0 \\
&[y^{5_0}] + [y^{5_{10}}] + y^{5_{13}} + x^{6_0} + k_{1_{11}} + k_{2_{11_2}} + k_{3_{11_2}} = 0 \\
&y^{5_2} + [y^{5_8}] + [y^{5_{15}}] + x^{6_2} + k_{1_{15}} + k_{2_{15_2}} + k_{3_{15_2}} = 0 \\
&y^{5_2} + x^{6_6} + k_{1_{15}} + k_{2_{15_2}} + k_{3_{15_2}} = 0 \\
&y^{5_3} + x^{6_7} + k_{1_{12}} + k_{2_{12_2}} + k_{3_{12_2}} = 0 \\
&y^{5_3} + y^{5_9} + x^{6_{15}} + k_{1_{12}} + k_{2_{12_2}} + k_{3_{12_2}} = 0 \\
&y^{5_4} + y^{5_{11}} + x^{6_9} + k_{1_9} + k_{2_{9_2}} + k_{3_{9_2}} = 0 \\
&[y^{5_7}] + [y^{5_{10}}] + x^{6_8} + k_{1_{14}} + k_{2_{14_2}} + k_{3_{14_2}} = 0 \\
&y^{6_0} + y^{6_{10}} + x^{7_{12}} + k_{1_3} + k_{2_{3_3}} + k_{3_{3_3}} = 0 \\
&[y^{6_1}] + [y^{6_{11}}] + [y^{6_{14}}] + x^{7_1} + k_{1_5} + k_{2_{5_3}} + k_{3_{5_3}} = 0 \\
&y^{6_2} + y^{6_8} + y^{6_{15}} + x^{7_2} + k_{1_7} + k_{2_{7_3}} + k_{3_{7_3}} = 0 \\
&[y^{6_4}] + [y^{6_{11}}] + x^{7_9} + k_{1_1} + k_{2_{1_3}} + k_{3_{1_3}} = 0 \\
&y^{6_6} + y^{6_9} + x^{7_{11}} + k_{1_0} + k_{2_{0_3}} + k_{3_{0_3}} = 0 \\
&y^{6_7} + y^{6_{10}} + x^{7_8} + k_{1_6} + k_{2_{6_3}} + k_{3_{6_3}} = 0 \\
&y^{7_0} + y^{7_{10}} + [y^{7_{13}}] + [x^{8_0}] + k_{1_{13}} + k_{2_{13_3}} + k_{3_{13_3}} = 0 \\
&y^{7_0} + y^{7_{10}} + x^{8_{12}} + k_{1_{13}} + k_{2_{13_3}} + k_{3_{13_3}} = 0 \\
&y^{7_1} + y^{7_{11}} + x^{8_{13}} + k_{1_{14}} + k_{2_{14_3}} + k_{3_{14_3}} = 0 \\
&y^{7_2} + y^{7_8} + x^{8_{14}} + k_{1_{11}} + k_{2_{11_3}} + k_{3_{11_3}} = 0 \\
&y^{7_3} + y^{7_9} + y^{7_{12}} + x^{8_3} + k_{1_{10}} + k_{2_{10_3}} + k_{3_{10_3}} = 0 \\
&y^{7_3} + x^{8_7} + k_{1_{10}} + k_{2_{10_3}} + k_{3_{10_3}} = 0 \\
&[y^{8_0}] + y^{8_{10}} + y^{8_{13}} + x^{9_0} + k_{1_5} + k_{2_{5_4}} + k_{3_{5_4}} = 0 \\
&[y^{8_0}] + x^{9_4} + k_{1_5} + k_{2_{5_4}} + k_{3_{5_4}} = 0 \\
&y^{8_1} + y^{8_{11}} + y^{8_{14}} + x^{9_1} + k_{1_6} + k_{2_{6_4}} + k_{3_{6_4}} = 0 \\
&y^{8_1} + y^{8_{11}} + x^{9_{13}} + k_{1_6} + k_{2_{6_4}} + k_{3_{6_4}} = 0 \\
&y^{8_3} + y^{8_9} + y^{8_{12}} + x^{9_3} + k_{1_2} + k_{2_{2_4}} + k_{3_{2_4}} = 0 \\
&y^{8_3} + x^{9_7} + k_{1_2} + k_{2_{2_4}} + k_{3_{2_4}} = 0 \\
&y^{8_3} + y^{8_9} + x^{9_{15}} + k_{1_2} + k_{2_{2_4}} + k_{3_{2_4}} = 0 \\
&y^{8_7} + y^{8_{10}} + x^{9_8} + k_{1_4} + k_{2_{4_4}} + k_{3_{4_4}} = 0
\end{aligned}$$

$$\begin{aligned}
&y^9_0 + y^9_{10} + y^9_{13} + x^{10}_0 + k_{1,14} + k_{2,14,4} + k_{3,14,4} = 0 \\
&y^9_1 + y^9_{11} + x^{10}_{13} + k_{1,12} + k_{2,12,4} + k_{3,12,4} = 0 \\
&y^9_2 + y^9_8 + y^9_{15} + x^{10}_2 + k_{1,13} + k_{2,13,4} + k_{3,13,4} = 0 \\
&y^9_2 + x^{10}_6 + k_{1,13} + k_{2,13,4} + k_{3,13,4} = 0 \\
&y^9_3 + x^{10}_7 + k_{1,8} + k_{2,8,4} + k_{3,8,4} = 0 \\
&y^9_4 + y^9_{11} + x^{10}_9 + k_{1,11} + k_{2,11,4} + k_{3,11,4} = 0 \\
&y^9_7 + y^9_{10} + x^{10}_8 + k_{1,10} + k_{2,10,4} + k_{3,10,4} = 0 \\
&y^{10}_0 + y^{10}_{10} + y^{10}_{13} + x^{11}_0 + k_{1,6} + k_{2,6,5} + k_{3,6,5} = 0 \\
&y^{10}_2 + y^{10}_8 + x^{11}_{14} + k_{1,5} + k_{2,5,5} + k_{3,5,5} = 0 \\
&y^{10}_6 + y^{10}_9 + x^{11}_{11} + k_{1,7} + k_{2,7,5} + k_{3,7,5} = 0 \\
&y^{10}_7 + y^{10}_{10} + x^{11}_8 + k_{1,2} + k_{2,2,5} + k_{3,2,5} = 0 \\
&y^{11}_0 + x^{12}_4 + k_{1,12} + k_{2,12,5} + k_{3,12,5} = 0 \\
&y^{11}_1 + y^{11}_{11} + y^{11}_{14} + x^{12}_1 + k_{1,10} + k_{2,10,5} + k_{3,10,5} = 0 \\
&y^{11}_1 + x^{12}_5 + k_{1,10} + k_{2,10,5} + k_{3,10,5} = 0 \\
&y^{11}_2 + x^{12}_6 + k_{1,14} + k_{2,14,5} + k_{3,14,5} = 0 \\
&y^{11}_2 + y^{11}_8 + x^{12}_{14} + k_{1,14} + k_{2,14,5} + k_{3,14,5} = 0 \\
&y^{12}_1 + y^{12}_{11} + y^{12}_{14} + x^{13}_1 + k_{1,2} + k_{2,2,6} + k_{3,2,6} = 0 \\
&y^{12}_2 + x^{13}_6 + k_{1,6} + k_{2,6,6} + k_{3,6,6} = 0 \\
&y^{12}_2 + y^{12}_8 + x^{13}_{14} + k_{1,6} + k_{2,6,6} + k_{3,6,6} = 0 \\
&y^{12}_3 + x^{13}_7 + k_{1,1} + k_{2,1,6} + k_{3,1,6} = 0 \\
&y^{12}_3 + y^{12}_9 + x^{13}_{15} + k_{1,1} + k_{2,1,6} + k_{3,1,6} = 0 \\
&y^{12}_4 + y^{12}_{11} + x^{13}_9 + k_{1,5} + k_{2,5,6} + k_{3,5,6} = 0 \\
&y^{12}_5 + y^{12}_8 + x^{13}_{10} + k_{1,7} + k_{2,7,6} + k_{3,7,6} = 0 \\
&y^{12}_6 + y^{12}_9 + x^{13}_{11} + k_{1,3} + k_{2,3,6} + k_{3,3,6} = 0 \\
&y^{13}_1 + y^{13}_{11} + y^{13}_{14} + x^{14}_1 + k_{1,8} + k_{2,8,6} + k_{3,8,6} = 0 \\
&y^{13}_2 + y^{13}_8 + y^{13}_{15} + x^{14}_2 + k_{1,12} + k_{2,12,6} + k_{3,12,6} = 0 \\
&y^{13}_2 + y^{13}_8 + x^{14}_{14} + k_{1,12} + k_{2,12,6} + k_{3,12,6} = 0 \\
&y^{13}_6 + y^{13}_9 + x^{14}_{11} + k_{1,13} + k_{2,13,6} + k_{3,13,6} = 0 \\
&y^{13}_7 + y^{13}_{10} + x^{14}_8 + k_{1,9} + k_{2,9,6} + k_{3,9,6} = 0 \\
&y^{14}_1 + y^{14}_{11} + y^{14}_{14} + x^{15}_1 + k_{1,0} + k_{2,0,7} + k_{3,0,7} = 0 \\
&y^{14}_2 + y^{14}_8 + x^{15}_{14} + k_{1,4} + k_{2,4,7} + k_{3,4,7} = 0 \\
&y^{15}_1 + [y^{15}_{11}] + y^{15}_{14} + [x^{16}_1] + k_{1,9} + k_{2,9,7} + k_{3,9,7} = 0 \\
&S(x^2_1) + y^2_1 = 0 \\
&S(x^3_5) + y^3_5 = 0 \\
&S(x^4_0) + y^4_0 = 0 \\
&S(x^4_6) + y^4_6 = 0 \\
&S(x^4_{10}) + y^4_{10} = 0 \\
&S(x^5_4) + y^5_4 = 0 \\
&S(x^5_9) + y^5_9 = 0 \\
&S(x^5_{11}) + y^5_{11} = 0 \\
&S(x^5_{13}) + y^5_{13} = 0 \\
&S(x^6_0) + y^6_0 = 0 \\
&S(x^6_2) + y^6_2 = 0 \\
&S(x^6_6) + y^6_6 = 0
\end{aligned}$$

$$S(x^6_7) + y^6_7 = 0$$

$$S(x^6_8) + y^6_8 = 0$$

$$S(x^6_9) + y^6_9 = 0$$

$$S(x^6_{15}) + y^6_{15} = 0$$

$$S(x^7_1) + y^7_1 = 0$$

$$S(x^7_2) + y^7_2 = 0$$

$$S(x^7_8) + y^7_8 = 0$$

$$S(x^7_9) + y^7_9 = 0$$

$$S(x^7_{11}) + y^7_{11} = 0$$

$$S(x^7_{12}) + y^7_{12} = 0$$

$$S(x^8_3) + y^8_3 = 0$$

$$S(x^8_7) + y^8_7 = 0$$

$$S(x^8_{12}) + y^8_{12} = 0$$

$$S(x^8_{13}) + y^8_{13} = 0$$

$$S(x^8_{14}) + y^8_{14} = 0$$

$$S(x^9_0) + y^9_0 = 0$$

$$S(x^9_1) + y^9_1 = 0$$

$$S(x^9_3) + y^9_3 = 0$$

$$S(x^9_4) + y^9_4 = 0$$

$$S(x^9_7) + y^9_7 = 0$$

$$S(x^9_8) + y^9_8 = 0$$

$$S(x^9_{13}) + y^9_{13} = 0$$

$$S(x^9_{15}) + y^9_{15} = 0$$

$$S(x^{10}_0) + y^{10}_0 = 0$$

$$S(x^{10}_2) + y^{10}_2 = 0$$

$$S(x^{10}_6) + y^{10}_6 = 0$$

$$S(x^{10}_7) + y^{10}_7 = 0$$

$$S(x^{10}_8) + y^{10}_8 = 0$$

$$S(x^{10}_9) + y^{10}_9 = 0$$

$$S(x^{10}_{13}) + y^{10}_{13} = 0$$

$$S(x^{11}_0) + y^{11}_0 = 0$$

$$S(x^{11}_8) + y^{11}_8 = 0$$

$$S(x^{11}_{11}) + y^{11}_{11} = 0$$

$$S(x^{11}_{14}) + y^{11}_{14} = 0$$

$$S(x^{12}_1) + y^{12}_1 = 0$$

$$S(x^{12}_4) + y^{12}_4 = 0$$

$$S(x^{12}_5) + y^{12}_5 = 0$$

$$S(x^{12}_6) + y^{12}_6 = 0$$

$$S(x^{12}_{14}) + y^{12}_{14} = 0$$

$$S(x^{13}_1) + y^{13}_1 = 0$$

$$S(x^{13}_6) + y^{13}_6 = 0$$

$$S(x^{13}_7) + y^{13}_7 = 0$$

$$S(x^{13}_9) + y^{13}_9 = 0$$

$$S(x^{13}_{10}) + y^{13}_{10} = 0$$

$$S(x^{13}_{11}) + y^{13}_{11} = 0$$

$$S(x^{13}_{14}) + y^{13}_{14} = 0$$

$$S(x^{13}_{15}) + y^{13}_{15} = 0$$

$$S(x^{14}_1) + y^{14}_1 = 0$$

$$S(x^{14}_2) + y^{14}_2 = 0$$

$$S(x^{14}_8) + y^{14}_8 = 0$$

$$S(x^{14}_{11}) + y^{14}_{11} = 0$$

$$S(x^{14}_{14}) + y^{14}_{14} = 0$$

$$S(x^{15}_1) + y^{15}_1 = 0$$

$$S(x^{15}_{14}) + y^{15}_{14} = 0$$

the 1 th Minimal Constraint set is:

$$[y^1_1] + y^1_{11} + [y^1_{14}] + x^2_1 + k1_{15} + k2_{15_0} + k3_{15_0} = 0$$

$$[y^1_1] + y^1_{11} + [x^2_{13}] + k1_{15} + k2_{15_0} + k3_{15_0} = 0$$

$$y^2_1 + x^3_5 + k1_7 + k2_{7_1} + k3_{7_1} = 0$$

$$[y^3_0] + [y^3_{10}] + [y^3_{13}] + x^4_0 + k1_{15} + k2_{15_1} + k3_{15_1} = 0$$

$$y^3_2 + x^4_6 + k1_9 + k2_{9_1} + k3_{9_1} = 0$$

$$y^3_2 + y^3_8 + x^4_{14} + k1_9 + k2_{9_1} + k3_{9_1} = 0$$

$$y^3_5 + y^3_8 + x^4_{10} + k1_{12} + k2_{12_1} + k3_{12_1} = 0$$

$$y^4_0 + y^4_{10} + x^5_{12} + k1_7 + k2_{7_2} + k3_{7_2} = 0$$

$$[y^4_1] + [y^4_{11}] + y^4_{14} + x^5_1 + k1_3 + k2_{3_2} + k3_{3_2} = 0$$

$$[y^4_1] + [y^4_{11}] + x^5_{13} + k1_3 + k2_{3_2} + k3_{3_2} = 0$$

$$[y^4_3] + y^4_9 + [x^5_{15}] + k1_6 + k2_{6_2} + k3_{6_2} = 0$$

$$[y^4_4] + [y^4_{11}] + x^5_9 + k1_0 + k2_{0_2} + k3_{0_2} = 0$$

$$y^4_6 + y^4_9 + x^5_{11} + k1_2 + k2_{2_2} + k3_{2_2} = 0$$

$$[y^5_0] + [y^5_{10}] + y^5_{13} + x^6_0 + k1_{11} + k2_{11_2} + k3_{11_2} = 0$$

$$y^5_1 + y^5_{11} + x^6_{13} + k1_{13} + k2_{13_2} + k3_{13_2} = 0$$

$$y^5_2 + [y^5_8] + [y^5_{15}] + x^6_2 + k1_{15} + k2_{15_2} + k3_{15_2} = 0$$

$$y^5_2 + x^6_6 + k1_{15} + k2_{15_2} + k3_{15_2} = 0$$

$$y^5_3 + y^5_9 + y^5_{12} + x^6_3 + k1_{12} + k2_{12_2} + k3_{12_2} = 0$$

$$y^5_3 + x^6_7 + k1_{12} + k2_{12_2} + k3_{12_2} = 0$$

$$[y^5_7] + [y^5_{10}] + x^6_8 + k1_{14} + k2_{14_2} + k3_{14_2} = 0$$

$$y^6_0 + y^6_{10} + y^6_{13} + x^7_0 + k1_3 + k2_{3_3} + k3_{3_3} = 0$$

$$y^6_2 + y^6_8 + x^7_{14} + k1_7 + k2_{7_3} + k3_{7_3} = 0$$

$$y^6_3 + y^6_9 + x^7_{15} + k1_4 + k2_{4_3} + k3_{4_3} = 0$$

$$y^6_6 + y^6_9 + x^7_{11} + k1_0 + k2_{0_3} + k3_{0_3} = 0$$

$$y^6_7 + y^6_{10} + x^7_8 + k1_6 + k2_{6_3} + k3_{6_3} = 0$$

$$y^7_0 + x^8_4 + k1_{13} + k2_{13_3} + k3_{13_3} = 0$$

$$y^7_1 + y^7_{11} + y^7_{14} + x^8_1 + k1_{14} + k2_{14_3} + k3_{14_3} = 0$$

$$y^7_1 + x^8_5 + k1_{14} + k2_{14_3} + k3_{14_3} = 0$$

$$y^7_2 + y^7_8 + y^7_{15} + x^8_2 + k1_{11} + k2_{11_3} + k3_{11_3} = 0$$

$$y^7_2 + x^8_6 + k1_{11} + k2_{11_3} + k3_{11_3} = 0$$

$$[y^8_0] + x^9_4 + k1_5 + k2_{5_4} + k3_{5_4} = 0$$

$$y^8_1 + y^8_{11} + x^9_{13} + k1_6 + k2_{6_4} + k3_{6_4} = 0$$

$$y^8_2 + y^8_8 + x^9_{14} + k1_3 + k2_{3_4} + k3_{3_4} = 0$$

$$\begin{aligned}
&y^8_3 + x^9_7 + k1_2 + k2_2_4 + k3_2_4 = 0 \\
&y^8_3 + y^8_9 + x^9_{15} + k1_2 + k2_2_4 + k3_2_4 = 0 \\
&y^8_4 + y^8_{11} + x^9_9 + k1_7 + k2_7_4 + k3_7_4 = 0 \\
&y^8_5 + y^8_8 + x^9_{10} + k1_0 + k2_0_4 + k3_0_4 = 0 \\
&y^8_6 + y^8_9 + x^9_{11} + k1_1 + k2_1_4 + k3_1_4 = 0 \\
&y^9_0 + y^9_{10} + y^9_{13} + x^{10}_0 + k1_{14} + k2_{14}_4 + k3_{14}_4 = 0 \\
&y^9_0 + y^9_{10} + x^{10}_{12} + k1_{14} + k2_{14}_4 + k3_{14}_4 = 0 \\
&y^9_1 + y^9_{11} + y^9_{14} + x^{10}_1 + k1_{12} + k2_{12}_4 + k3_{12}_4 = 0 \\
&y^9_1 + y^9_{11} + x^{10}_{13} + k1_{12} + k2_{12}_4 + k3_{12}_4 = 0 \\
&y^9_2 + y^9_8 + y^9_{15} + x^{10}_2 + k1_{13} + k2_{13}_4 + k3_{13}_4 = 0 \\
&y^9_2 + y^9_8 + x^{10}_{14} + k1_{13} + k2_{13}_4 + k3_{13}_4 = 0 \\
&y^9_3 + x^{10}_7 + k1_8 + k2_8_4 + k3_8_4 = 0 \\
&y^9_3 + y^9_9 + x^{10}_{15} + k1_8 + k2_8_4 + k3_8_4 = 0 \\
&y^9_4 + y^9_{11} + x^{10}_9 + k1_{11} + k2_{11}_4 + k3_{11}_4 = 0 \\
&y^9_7 + y^9_{10} + x^{10}_8 + k1_{10} + k2_{10}_4 + k3_{10}_4 = 0 \\
&y^{10}_0 + y^{10}_{10} + y^{10}_{13} + x^{11}_0 + k1_6 + k2_6_5 + k3_6_5 = 0 \\
&y^{10}_1 + y^{10}_{11} + y^{10}_{14} + x^{11}_1 + k1_4 + k2_4_5 + k3_4_5 = 0 \\
&y^{10}_1 + x^{11}_5 + k1_4 + k2_4_5 + k3_4_5 = 0 \\
&y^{10}_1 + y^{10}_{11} + x^{11}_{13} + k1_4 + k2_4_5 + k3_4_5 = 0 \\
&y^{10}_2 + y^{10}_8 + y^{10}_{15} + x^{11}_2 + k1_5 + k2_5_5 + k3_5_5 = 0 \\
&y^{10}_3 + y^{10}_9 + y^{10}_{12} + x^{11}_3 + k1_0 + k2_0_5 + k3_0_5 = 0 \\
&y^{10}_3 + x^{11}_7 + k1_0 + k2_0_5 + k3_0_5 = 0 \\
&y^{10}_7 + y^{10}_{10} + x^{11}_8 + k1_2 + k2_2_5 + k3_2_5 = 0 \\
&y^{11}_0 + y^{11}_{10} + y^{11}_{13} + x^{12}_0 + k1_{12} + k2_{12}_5 + k3_{12}_5 = 0 \\
&y^{11}_1 + x^{12}_5 + k1_{10} + k2_{10}_5 + k3_{10}_5 = 0 \\
&y^{11}_2 + x^{12}_6 + k1_{14} + k2_{14}_5 + k3_{14}_5 = 0 \\
&y^{11}_3 + x^{12}_7 + k1_9 + k2_9_5 + k3_9_5 = 0 \\
&y^{11}_5 + y^{11}_8 + x^{12}_{10} + k1_{15} + k2_{15}_5 + k3_{15}_5 = 0 \\
&y^{11}_7 + y^{11}_{10} + x^{12}_8 + k1_8 + k2_8_5 + k3_8_5 = 0 \\
&y^{12}_0 + x^{13}_4 + k1_4 + k2_4_6 + k3_4_6 = 0 \\
&y^{12}_3 + x^{13}_7 + k1_1 + k2_1_6 + k3_1_6 = 0 \\
&y^{12}_3 + y^{12}_9 + x^{13}_{15} + k1_1 + k2_1_6 + k3_1_6 = 0 \\
&y^{12}_5 + y^{12}_8 + x^{13}_{10} + k1_7 + k2_7_6 + k3_7_6 = 0 \\
&y^{12}_6 + y^{12}_9 + x^{13}_{11} + k1_3 + k2_3_6 + k3_3_6 = 0 \\
&y^{12}_7 + y^{12}_{10} + x^{13}_8 + k1_0 + k2_0_6 + k3_0_6 = 0 \\
&y^{13}_2 + y^{13}_8 + y^{13}_{15} + x^{14}_2 + k1_{12} + k2_{12}_6 + k3_{12}_6 = 0 \\
&y^{13}_2 + x^{14}_6 + k1_{12} + k2_{12}_6 + k3_{12}_6 = 0 \\
&y^{13}_4 + y^{13}_{11} + x^{14}_9 + k1_{14} + k2_{14}_6 + k3_{14}_6 = 0 \\
&y^{13}_7 + y^{13}_{10} + x^{14}_8 + k1_9 + k2_9_6 + k3_9_6 = 0 \\
&y^{14}_2 + y^{14}_8 + x^{15}_{14} + k1_4 + k2_4_7 + k3_4_7 = 0 \\
&y^{14}_6 + y^{14}_9 + [x^{15}_{11}] + k1_5 + k2_5_7 + k3_5_7 = 0 \\
&y^{15}_1 + [y^{15}_{11}] + y^{15}_{14} + [x^{16}_1] + k1_9 + k2_9_7 + k3_9_7 = 0 \\
&y^{15}_1 + [y^{15}_{11}] + [x^{16}_{13}] + k1_9 + k2_9_7 + k3_9_7 = 0 \\
&S(x^2_1) + y^2_1 = 0
\end{aligned}$$

$$\begin{aligned}
&S(x^3_5) + y^3_5 = 0 \\
&S(x^4_0) + y^4_0 = 0 \\
&S(x^4_6) + y^4_6 = 0 \\
&S(x^4_{10}) + y^4_{10} = 0 \\
&S(x^4_{14}) + y^4_{14} = 0 \\
&S(x^5_1) + y^5_1 = 0 \\
&S(x^5_9) + y^5_9 = 0 \\
&S(x^5_{11}) + y^5_{11} = 0 \\
&S(x^5_{12}) + y^5_{12} = 0 \\
&S(x^5_{13}) + y^5_{13} = 0 \\
&S(x^6_0) + y^6_0 = 0 \\
&S(x^6_2) + y^6_2 = 0 \\
&S(x^6_3) + y^6_3 = 0 \\
&S(x^6_6) + y^6_6 = 0 \\
&S(x^6_7) + y^6_7 = 0 \\
&S(x^6_8) + y^6_8 = 0 \\
&S(x^6_{13}) + y^6_{13} = 0 \\
&S(x^7_0) + y^7_0 = 0 \\
&S(x^7_8) + y^7_8 = 0 \\
&S(x^7_{11}) + y^7_{11} = 0 \\
&S(x^7_{14}) + y^7_{14} = 0 \\
&S(x^7_{15}) + y^7_{15} = 0 \\
&S(x^8_1) + y^8_1 = 0 \\
&S(x^8_2) + y^8_2 = 0 \\
&S(x^8_4) + y^8_4 = 0 \\
&S(x^8_5) + y^8_5 = 0 \\
&S(x^8_6) + y^8_6 = 0 \\
&S(x^9_4) + y^9_4 = 0 \\
&S(x^9_7) + y^9_7 = 0 \\
&S(x^9_9) + y^9_9 = 0 \\
&S(x^9_{10}) + y^9_{10} = 0 \\
&S(x^9_{11}) + y^9_{11} = 0 \\
&S(x^9_{13}) + y^9_{13} = 0 \\
&S(x^9_{14}) + y^9_{14} = 0 \\
&S(x^9_{15}) + y^9_{15} = 0 \\
&S(x^{10}_0) + y^{10}_0 = 0 \\
&S(x^{10}_1) + y^{10}_1 = 0 \\
&S(x^{10}_2) + y^{10}_2 = 0 \\
&S(x^{10}_7) + y^{10}_7 = 0 \\
&S(x^{10}_8) + y^{10}_8 = 0 \\
&S(x^{10}_9) + y^{10}_9 = 0 \\
&S(x^{10}_{12}) + y^{10}_{12} = 0 \\
&S(x^{10}_{13}) + y^{10}_{13} = 0 \\
&S(x^{10}_{14}) + y^{10}_{14} = 0
\end{aligned}$$

$$\begin{aligned}
&S(x^{10}_{15}) + y^{10}_{15} = 0 \\
&S(x^{11}_0) + y^{11}_0 = 0 \\
&S(x^{11}_1) + y^{11}_1 = 0 \\
&S(x^{11}_2) + y^{11}_2 = 0 \\
&S(x^{11}_3) + y^{11}_3 = 0 \\
&S(x^{11}_5) + y^{11}_5 = 0 \\
&S(x^{11}_7) + y^{11}_7 = 0 \\
&S(x^{11}_8) + y^{11}_8 = 0 \\
&S(x^{11}_{13}) + y^{11}_{13} = 0 \\
&S(x^{12}_0) + y^{12}_0 = 0 \\
&S(x^{12}_5) + y^{12}_5 = 0 \\
&S(x^{12}_6) + y^{12}_6 = 0 \\
&S(x^{12}_7) + y^{12}_7 = 0 \\
&S(x^{12}_8) + y^{12}_8 = 0 \\
&S(x^{12}_{10}) + y^{12}_{10} = 0 \\
&S(x^{13}_4) + y^{13}_4 = 0 \\
&S(x^{13}_7) + y^{13}_7 = 0 \\
&S(x^{13}_8) + y^{13}_8 = 0 \\
&S(x^{13}_{10}) + y^{13}_{10} = 0 \\
&S(x^{13}_{11}) + y^{13}_{11} = 0 \\
&S(x^{13}_{15}) + y^{13}_{15} = 0 \\
&S(x^{14}_2) + y^{14}_2 = 0 \\
&S(x^{14}_6) + y^{14}_6 = 0 \\
&S(x^{14}_8) + y^{14}_8 = 0 \\
&S(x^{14}_9) + y^{14}_9 = 0 \\
&S(x^{15}_{14}) + y^{15}_{14} = 0
\end{aligned}$$

the 2 th Minimal Constraint set is:

$$\begin{aligned}
&[y^1_1] + y^1_{11} + [y^1_{14}] + x^2_1 + k1_{15} + k2_{15_0} + k3_{15_0} = 0 \\
&[y^1_1] + y^1_{11} + [x^2_{13}] + k1_{15} + k2_{15_0} + k3_{15_0} = 0 \\
&y^2_1 + x^3_5 + k1_7 + k2_{7_1} + k3_{7_1} = 0 \\
&[y^3_0] + [y^3_{10}] + [y^3_{13}] + x^4_0 + k1_{15} + k2_{15_1} + k3_{15_1} = 0 \\
&y^3_2 + y^3_8 + [y^3_{15}] + [x^4_2] + k1_9 + k2_{9_1} + k3_{9_1} = 0 \\
&y^3_2 + x^4_6 + k1_9 + k2_{9_1} + k3_{9_1} = 0 \\
&y^3_5 + y^3_8 + x^4_{10} + k1_{12} + k2_{12_1} + k3_{12_1} = 0 \\
&y^4_0 + x^5_4 + k1_7 + k2_{7_2} + k3_{7_2} = 0 \\
&[y^4_1] + [y^4_{11}] + x^5_{13} + k1_3 + k2_{3_2} + k3_{3_2} = 0 \\
&[y^4_3] + y^4_9 + [x^5_{15}] + k1_6 + k2_{6_2} + k3_{6_2} = 0 \\
&[y^4_4] + [y^4_{11}] + x^5_9 + k1_0 + k2_{0_2} + k3_{0_2} = 0 \\
&y^4_6 + y^4_9 + x^5_{11} + k1_2 + k2_{2_2} + k3_{2_2} = 0 \\
&[y^4_7] + y^4_{10} + [x^5_8] + k1_5 + k2_{5_2} + k3_{5_2} = 0 \\
&[y^5_0] + [y^5_{10}] + y^5_{13} + x^6_0 + k1_{11} + k2_{11_2} + k3_{11_2} = 0 \\
&[y^5_0] + [y^5_{10}] + x^6_{12} + k1_{11} + k2_{11_2} + k3_{11_2} = 0 \\
&y^5_2 + [y^5_8] + [y^5_{15}] + x^6_2 + k1_{15} + k2_{15_2} + k3_{15_2} = 0 \\
&y^5_2 + x^6_6 + k1_{15} + k2_{15_2} + k3_{15_2} = 0
\end{aligned}$$

$$\begin{aligned}
&y^5_3 + x^6_7 + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&y^5_3 + y^5_9 + x^6_{15} + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&y^5_4 + y^5_{11} + x^6_9 + k1_9 + k2_{9_2} + k3_{9_2} = 0 \\
&y^6_0 + y^6_{10} + x^7_{12} + k1_3 + k2_{3_3} + k3_{3_3} = 0 \\
&[y^6_1] + [y^6_{11}] + [y^6_{14}] + x^7_1 + k1_5 + k2_{5_3} + k3_{5_3} = 0 \\
&y^6_2 + y^6_8 + y^6_{15} + x^7_2 + k1_7 + k2_{7_3} + k3_{7_3} = 0 \\
&y^6_2 + x^7_6 + k1_7 + k2_{7_3} + k3_{7_3} = 0 \\
&y^6_2 + y^6_8 + x^7_{14} + k1_7 + k2_{7_3} + k3_{7_3} = 0 \\
&y^6_3 + y^6_9 + y^6_{12} + x^7_3 + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&y^6_3 + y^6_9 + x^7_{15} + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&[y^6_4] + [y^6_{11}] + x^7_9 + k1_1 + k2_{1_3} + k3_{1_3} = 0 \\
&y^6_6 + y^6_9 + x^7_{11} + k1_0 + k2_{0_3} + k3_{0_3} = 0 \\
&y^6_7 + y^6_{10} + x^7_8 + k1_6 + k2_{6_3} + k3_{6_3} = 0 \\
&y^7_1 + y^7_{11} + y^7_{14} + x^8_1 + k1_{14} + k2_{14_3} + k3_{14_3} = 0 \\
&y^7_2 + y^7_8 + y^7_{15} + x^8_2 + k1_{11} + k2_{11_3} + k3_{11_3} = 0 \\
&y^7_3 + y^7_9 + y^7_{12} + x^8_3 + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_3 + x^8_7 + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_3 + y^7_9 + x^8_{15} + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_6 + y^7_9 + x^8_{11} + k1_9 + k2_{9_3} + k3_{9_3} = 0 \\
&[y^8_0] + y^8_{10} + x^9_{12} + k1_5 + k2_{5_4} + k3_{5_4} = 0 \\
&y^8_1 + y^8_{11} + x^9_{13} + k1_6 + k2_{6_4} + k3_{6_4} = 0 \\
&y^8_2 + y^8_8 + y^8_{15} + x^9_2 + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_2 + x^9_6 + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_2 + y^8_8 + x^9_{14} + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_3 + x^9_7 + k1_2 + k2_{2_4} + k3_{2_4} = 0 \\
&y^8_7 + y^8_{10} + x^9_8 + k1_4 + k2_{4_4} + k3_{4_4} = 0 \\
&y^9_0 + y^9_{10} + y^9_{13} + x^{10}_0 + k1_{14} + k2_{14_4} + k3_{14_4} = 0 \\
&y^9_0 + x^{10}_4 + k1_{14} + k2_{14_4} + k3_{14_4} = 0 \\
&y^9_1 + y^9_{11} + y^9_{14} + x^{10}_1 + k1_{12} + k2_{12_4} + k3_{12_4} = 0 \\
&y^9_1 + y^9_{11} + x^{10}_{13} + k1_{12} + k2_{12_4} + k3_{12_4} = 0 \\
&y^9_2 + y^9_8 + x^{10}_{14} + k1_{13} + k2_{13_4} + k3_{13_4} = 0 \\
&y^9_3 + y^9_9 + y^9_{12} + x^{10}_3 + k1_8 + k2_{8_4} + k3_{8_4} = 0 \\
&y^9_3 + x^{10}_7 + k1_8 + k2_{8_4} + k3_{8_4} = 0 \\
&y^9_6 + y^9_9 + x^{10}_{11} + k1_{15} + k2_{15_4} + k3_{15_4} = 0 \\
&y^9_7 + y^9_{10} + x^{10}_8 + k1_{10} + k2_{10_4} + k3_{10_4} = 0 \\
&y^{10}_0 + y^{10}_{10} + y^{10}_{13} + x^{11}_0 + k1_6 + k2_{6_5} + k3_{6_5} = 0 \\
&y^{10}_1 + y^{10}_{11} + y^{10}_{14} + x^{11}_1 + k1_4 + k2_{4_5} + k3_{4_5} = 0 \\
&y^{10}_1 + x^{11}_5 + k1_4 + k2_{4_5} + k3_{4_5} = 0 \\
&y^{10}_1 + y^{10}_{11} + x^{11}_{13} + k1_4 + k2_{4_5} + k3_{4_5} = 0 \\
&y^{10}_2 + x^{11}_6 + k1_5 + k2_{5_5} + k3_{5_5} = 0 \\
&y^{10}_2 + y^{10}_8 + x^{11}_{14} + k1_5 + k2_{5_5} + k3_{5_5} = 0 \\
&y^{10}_3 + x^{11}_7 + k1_0 + k2_{0_5} + k3_{0_5} = 0 \\
&y^{10}_4 + y^{10}_{11} + x^{11}_9 + k1_3 + k2_{3_5} + k3_{3_5} = 0 \\
&y^{10}_7 + y^{10}_{10} + x^{11}_8 + k1_2 + k2_{2_5} + k3_{2_5} = 0
\end{aligned}$$

$$\begin{aligned}
&y^{11}_0 + y^{11}_{10} + y^{11}_{13} + x^{12}_0 + k_{1,12} + k_{2,12,5} + k_{3,12,5} = 0 \\
&y^{11}_1 + y^{11}_{11} + y^{11}_{14} + x^{12}_1 + k_{1,10} + k_{2,10,5} + k_{3,10,5} = 0 \\
&y^{11}_1 + x^{12}_5 + k_{1,10} + k_{2,10,5} + k_{3,10,5} = 0 \\
&y^{11}_1 + y^{11}_{11} + x^{12}_{13} + k_{1,10} + k_{2,10,5} + k_{3,10,5} = 0 \\
&y^{11}_5 + y^{11}_8 + x^{12}_{10} + k_{1,15} + k_{2,15,5} + k_{3,15,5} = 0 \\
&y^{11}_6 + y^{11}_9 + x^{12}_{11} + k_{1,11} + k_{2,11,5} + k_{3,11,5} = 0 \\
&y^{11}_7 + y^{11}_{10} + x^{12}_8 + k_{1,8} + k_{2,8,5} + k_{3,8,5} = 0 \\
&y^{12}_0 + y^{12}_{10} + y^{12}_{13} + x^{13}_0 + k_{1,4} + k_{2,4,6} + k_{3,4,6} = 0 \\
&y^{12}_1 + y^{12}_{11} + x^{13}_{13} + k_{1,2} + k_{2,2,6} + k_{3,2,6} = 0 \\
&y^{12}_5 + y^{12}_8 + x^{13}_{10} + k_{1,7} + k_{2,7,6} + k_{3,7,6} = 0 \\
&y^{13}_0 + y^{13}_{10} + y^{13}_{13} + x^{14}_0 + k_{1,10} + k_{2,10,6} + k_{3,10,6} = 0 \\
&y^{14}_0 + x^{15}_4 + k_{1,2} + k_{2,2,7} + k_{3,2,7} = 0 \\
&y^{15}_4 + [y^{15}_{11}] + [x^{16}_9] + k_{1,12} + k_{2,12,7} + k_{3,12,7} = 0 \\
&S(x^2_1) + y^2_1 = 0 \\
&S(x^3_5) + y^3_5 = 0 \\
&S(x^4_0) + y^4_0 = 0 \\
&S(x^4_6) + y^4_6 = 0 \\
&S(x^4_{10}) + y^4_{10} = 0 \\
&S(x^5_4) + y^5_4 = 0 \\
&S(x^5_9) + y^5_9 = 0 \\
&S(x^5_{11}) + y^5_{11} = 0 \\
&S(x^5_{13}) + y^5_{13} = 0 \\
&S(x^6_0) + y^6_0 = 0 \\
&S(x^6_2) + y^6_2 = 0 \\
&S(x^6_6) + y^6_6 = 0 \\
&S(x^6_7) + y^6_7 = 0 \\
&S(x^6_9) + y^6_9 = 0 \\
&S(x^6_{12}) + y^6_{12} = 0 \\
&S(x^6_{15}) + y^6_{15} = 0 \\
&S(x^7_1) + y^7_1 = 0 \\
&S(x^7_2) + y^7_2 = 0 \\
&S(x^7_3) + y^7_3 = 0 \\
&S(x^7_6) + y^7_6 = 0 \\
&S(x^7_8) + y^7_8 = 0 \\
&S(x^7_9) + y^7_9 = 0 \\
&S(x^7_{11}) + y^7_{11} = 0 \\
&S(x^7_{12}) + y^7_{12} = 0 \\
&S(x^7_{14}) + y^7_{14} = 0 \\
&S(x^7_{15}) + y^7_{15} = 0 \\
&S(x^8_1) + y^8_1 = 0 \\
&S(x^8_2) + y^8_2 = 0 \\
&S(x^8_3) + y^8_3 = 0 \\
&S(x^8_7) + y^8_7 = 0 \\
&S(x^8_{11}) + y^8_{11} = 0
\end{aligned}$$

$$\begin{aligned}
S(x^{8}_{15}) + y^{8}_{15} &= 0 \\
S(x^{9}_{2}) + y^{9}_{2} &= 0 \\
S(x^{9}_{6}) + y^{9}_{6} &= 0 \\
S(x^{9}_{7}) + y^{9}_{7} &= 0 \\
S(x^{9}_{8}) + y^{9}_{8} &= 0 \\
S(x^{9}_{12}) + y^{9}_{12} &= 0 \\
S(x^{9}_{13}) + y^{9}_{13} &= 0 \\
S(x^{9}_{14}) + y^{9}_{14} &= 0 \\
S(x^{10}_{0}) + y^{10}_{0} &= 0 \\
S(x^{10}_{1}) + y^{10}_{1} &= 0 \\
S(x^{10}_{3}) + y^{10}_{3} &= 0 \\
S(x^{10}_{4}) + y^{10}_{4} &= 0 \\
S(x^{10}_{7}) + y^{10}_{7} &= 0 \\
S(x^{10}_{8}) + y^{10}_{8} &= 0 \\
S(x^{10}_{11}) + y^{10}_{11} &= 0 \\
S(x^{10}_{13}) + y^{10}_{13} &= 0 \\
S(x^{10}_{14}) + y^{10}_{14} &= 0 \\
S(x^{11}_{0}) + y^{11}_{0} &= 0 \\
S(x^{11}_{1}) + y^{11}_{1} &= 0 \\
S(x^{11}_{5}) + y^{11}_{5} &= 0 \\
S(x^{11}_{6}) + y^{11}_{6} &= 0 \\
S(x^{11}_{7}) + y^{11}_{7} &= 0 \\
S(x^{11}_{8}) + y^{11}_{8} &= 0 \\
S(x^{11}_{9}) + y^{11}_{9} &= 0 \\
S(x^{11}_{13}) + y^{11}_{13} &= 0 \\
S(x^{11}_{14}) + y^{11}_{14} &= 0 \\
S(x^{12}_{0}) + y^{12}_{0} &= 0 \\
S(x^{12}_{1}) + y^{12}_{1} &= 0 \\
S(x^{12}_{5}) + y^{12}_{5} &= 0 \\
S(x^{12}_{8}) + y^{12}_{8} &= 0 \\
S(x^{12}_{10}) + y^{12}_{10} &= 0 \\
S(x^{12}_{11}) + y^{12}_{11} &= 0 \\
S(x^{12}_{13}) + y^{12}_{13} &= 0 \\
S(x^{13}_{0}) + y^{13}_{0} &= 0 \\
S(x^{13}_{10}) + y^{13}_{10} &= 0 \\
S(x^{13}_{13}) + y^{13}_{13} &= 0 \\
S(x^{14}_{0}) + y^{14}_{0} &= 0 \\
S(x^{15}_{4}) + y^{15}_{4} &= 0
\end{aligned}$$

the 3 th Minimal Constraint set is:

$$\begin{aligned}
[y^1_{11}] + y^1_{11} + [y^1_{14}] + x^2_{21} + k1_{15} + k2_{15_0} + k3_{15_0} &= 0 \\
[y^1_{11}] + y^1_{11} + [x^2_{13}] + k1_{15} + k2_{15_0} + k3_{15_0} &= 0 \\
y^2_{21} + x^3_{35} + k1_7 + k2_{7_1} + k3_{7_1} &= 0 \\
y^3_{32} + y^3_{38} + [y^3_{15}] + [x^4_{42}] + k1_9 + k2_{9_1} + k3_{9_1} &= 0 \\
y^3_{32} + x^4_{46} + k1_9 + k2_{9_1} + k3_{9_1} &= 0
\end{aligned}$$

$$\begin{aligned}
&y^3_5 + y^3_8 + x^4_{10} + k1_{12} + k2_{12_1} + k3_{12_1} = 0 \\
&[y^3_7] + [y^3_{10}] + x^4_8 + k1_{13} + k2_{13_1} + k3_{13_1} = 0 \\
&[y^4_2] + y^4_8 + [y^4_{15}] + x^5_2 + k1_1 + k2_{1_2} + k3_{1_2} = 0 \\
&[y^4_3] + y^4_9 + [x^5_{15}] + k1_6 + k2_{6_2} + k3_{6_2} = 0 \\
&[y^4_4] + [y^4_{11}] + x^5_9 + k1_0 + k2_{0_2} + k3_{0_2} = 0 \\
&y^4_6 + y^4_9 + x^5_{11} + k1_2 + k2_{2_2} + k3_{2_2} = 0 \\
&[y^4_7] + y^4_{10} + [x^5_8] + k1_5 + k2_{5_2} + k3_{5_2} = 0 \\
&[y^5_0] + [y^5_{10}] + x^6_{12} + k1_{11} + k2_{11_2} + k3_{11_2} = 0 \\
&y^5_1 + x^6_5 + k1_{13} + k2_{13_2} + k3_{13_2} = 0 \\
&y^5_1 + y^5_{11} + x^6_{13} + k1_{13} + k2_{13_2} + k3_{13_2} = 0 \\
&y^5_2 + x^6_6 + k1_{15} + k2_{15_2} + k3_{15_2} = 0 \\
&y^5_3 + x^6_7 + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&y^5_3 + y^5_9 + x^6_{15} + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&y^6_0 + y^6_{10} + y^6_{13} + x^7_0 + k1_3 + k2_{3_3} + k3_{3_3} = 0 \\
&y^6_0 + x^7_4 + k1_3 + k2_{3_3} + k3_{3_3} = 0 \\
&[y^6_1] + [y^6_{11}] + [y^6_{14}] + x^7_1 + k1_5 + k2_{5_3} + k3_{5_3} = 0 \\
&[y^6_1] + x^7_5 + k1_5 + k2_{5_3} + k3_{5_3} = 0 \\
&y^6_2 + y^6_8 + y^6_{15} + x^7_2 + k1_7 + k2_{7_3} + k3_{7_3} = 0 \\
&y^6_2 + x^7_6 + k1_7 + k2_{7_3} + k3_{7_3} = 0 \\
&y^6_3 + y^6_9 + y^6_{12} + x^7_3 + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&y^6_3 + x^7_7 + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&y^6_5 + y^6_8 + x^7_{10} + k1_2 + k2_{2_3} + k3_{2_3} = 0 \\
&y^6_6 + y^6_9 + x^7_{11} + k1_0 + k2_{0_3} + k3_{0_3} = 0 \\
&y^6_7 + y^6_{10} + x^7_8 + k1_6 + k2_{6_3} + k3_{6_3} = 0 \\
&y^7_0 + x^8_4 + k1_{13} + k2_{13_3} + k3_{13_3} = 0 \\
&y^7_1 + x^8_5 + k1_{14} + k2_{14_3} + k3_{14_3} = 0 \\
&y^7_2 + x^8_6 + k1_{11} + k2_{11_3} + k3_{11_3} = 0 \\
&y^7_3 + y^7_9 + x^8_{15} + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_4 + y^7_{11} + x^8_9 + k1_{15} + k2_{15_3} + k3_{15_3} = 0 \\
&y^7_5 + y^7_8 + x^8_{10} + k1_8 + k2_{8_3} + k3_{8_3} = 0 \\
&y^7_6 + y^7_9 + x^8_{11} + k1_9 + k2_{9_3} + k3_{9_3} = 0 \\
&y^7_7 + y^7_{10} + x^8_8 + k1_{12} + k2_{12_3} + k3_{12_3} = 0 \\
&[y^8_0] + x^9_4 + k1_5 + k2_{5_4} + k3_{5_4} = 0 \\
&[y^8_0] + y^8_{10} + x^9_{12} + k1_5 + k2_{5_4} + k3_{5_4} = 0 \\
&y^8_2 + y^8_8 + y^8_{15} + x^9_2 + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_2 + y^8_8 + x^9_{14} + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_4 + y^8_{11} + x^9_9 + k1_7 + k2_{7_4} + k3_{7_4} = 0 \\
&y^8_5 + y^8_8 + x^9_{10} + k1_0 + k2_{0_4} + k3_{0_4} = 0 \\
&y^8_6 + y^8_9 + x^9_{11} + k1_1 + k2_{1_4} + k3_{1_4} = 0 \\
&y^9_0 + x^{10}_4 + k1_{14} + k2_{14_4} + k3_{14_4} = 0 \\
&y^9_0 + y^9_{10} + x^{10}_{12} + k1_{14} + k2_{14_4} + k3_{14_4} = 0 \\
&y^9_1 + y^9_{11} + y^9_{14} + x^{10}_1 + k1_{12} + k2_{12_4} + k3_{12_4} = 0 \\
&y^9_1 + y^9_{11} + x^{10}_{13} + k1_{12} + k2_{12_4} + k3_{12_4} = 0 \\
&y^9_2 + x^{10}_6 + k1_{13} + k2_{13_4} + k3_{13_4} = 0
\end{aligned}$$

$$\begin{aligned}
& y^9_3 + y^9_9 + y^9_{12} + x^{10}_3 + k1_8 + k2_{8_4} + k3_{8_4} = 0 \\
& y^9_3 + x^{10}_7 + k1_8 + k2_{8_4} + k3_{8_4} = 0 \\
& y^9_4 + y^9_{11} + x^{10}_9 + k1_{11} + k2_{11_4} + k3_{11_4} = 0 \\
& y^{10}_0 + y^{10}_{10} + y^{10}_{13} + x^{11}_0 + k1_6 + k2_{6_5} + k3_{6_5} = 0 \\
& y^{10}_0 + x^{11}_4 + k1_6 + k2_{6_5} + k3_{6_5} = 0 \\
& y^{10}_1 + y^{10}_{11} + x^{11}_{13} + k1_4 + k2_{4_5} + k3_{4_5} = 0 \\
& y^{10}_3 + y^{10}_9 + y^{10}_{12} + x^{11}_3 + k1_0 + k2_{0_5} + k3_{0_5} = 0 \\
& y^{10}_3 + x^{11}_7 + k1_0 + k2_{0_5} + k3_{0_5} = 0 \\
& y^{10}_3 + y^{10}_9 + x^{11}_{15} + k1_0 + k2_{0_5} + k3_{0_5} = 0 \\
& y^{10}_4 + y^{10}_{11} + x^{11}_9 + k1_3 + k2_{3_5} + k3_{3_5} = 0 \\
& y^{10}_6 + y^{10}_9 + x^{11}_{11} + k1_7 + k2_{7_5} + k3_{7_5} = 0 \\
& y^{10}_7 + y^{10}_{10} + x^{11}_8 + k1_2 + k2_{2_5} + k3_{2_5} = 0 \\
& y^{11}_0 + y^{11}_{10} + y^{11}_{13} + x^{12}_0 + k1_{12} + k2_{12_5} + k3_{12_5} = 0 \\
& y^{11}_2 + y^{11}_8 + y^{11}_{15} + x^{12}_2 + k1_{14} + k2_{14_5} + k3_{14_5} = 0 \\
& y^{11}_2 + x^{12}_6 + k1_{14} + k2_{14_5} + k3_{14_5} = 0 \\
& y^{11}_3 + y^{11}_9 + x^{12}_{15} + k1_9 + k2_{9_5} + k3_{9_5} = 0 \\
& y^{11}_4 + y^{11}_{11} + x^{12}_9 + k1_{13} + k2_{13_5} + k3_{13_5} = 0 \\
& y^{11}_7 + y^{11}_{10} + x^{12}_8 + k1_8 + k2_{8_5} + k3_{8_5} = 0 \\
& y^{12}_0 + x^{13}_4 + k1_4 + k2_{4_6} + k3_{4_6} = 0 \\
& y^{12}_2 + y^{12}_8 + y^{12}_{15} + x^{13}_2 + k1_6 + k2_{6_6} + k3_{6_6} = 0 \\
& y^{12}_6 + y^{12}_9 + x^{13}_{11} + k1_3 + k2_{3_6} + k3_{3_6} = 0 \\
& y^{13}_2 + x^{14}_6 + k1_{12} + k2_{12_6} + k3_{12_6} = 0 \\
& y^{13}_4 + y^{13}_{11} + x^{14}_9 + k1_{14} + k2_{14_6} + k3_{14_6} = 0 \\
& y^{14}_6 + y^{14}_9 + [x^{15}_{11}] + k1_5 + k2_{5_7} + k3_{5_7} = 0 \\
& S(x^2_1) + y^2_1 = 0 \\
& S(x^3_5) + y^3_5 = 0 \\
& S(x^4_6) + y^4_6 = 0 \\
& S(x^4_8) + y^4_8 = 0 \\
& S(x^4_{10}) + y^4_{10} = 0 \\
& S(x^5_2) + y^5_2 = 0 \\
& S(x^5_9) + y^5_9 = 0 \\
& S(x^5_{11}) + y^5_{11} = 0 \\
& S(x^6_5) + y^6_5 = 0 \\
& S(x^6_6) + y^6_6 = 0 \\
& S(x^6_7) + y^6_7 = 0 \\
& S(x^6_{12}) + y^6_{12} = 0 \\
& S(x^6_{13}) + y^6_{13} = 0 \\
& S(x^6_{15}) + y^6_{15} = 0 \\
& S(x^7_0) + y^7_0 = 0 \\
& S(x^7_1) + y^7_1 = 0 \\
& S(x^7_2) + y^7_2 = 0 \\
& S(x^7_3) + y^7_3 = 0 \\
& S(x^7_4) + y^7_4 = 0 \\
& S(x^7_5) + y^7_5 = 0
\end{aligned}$$

$$\begin{aligned}
&S(x^7_6) + y^7_6 = 0 \\
&S(x^7_7) + y^7_7 = 0 \\
&S(x^7_8) + y^7_8 = 0 \\
&S(x^7_{10}) + y^7_{10} = 0 \\
&S(x^7_{11}) + y^7_{11} = 0 \\
&S(x^8_4) + y^8_4 = 0 \\
&S(x^8_5) + y^8_5 = 0 \\
&S(x^8_6) + y^8_6 = 0 \\
&S(x^8_8) + y^8_8 = 0 \\
&S(x^8_9) + y^8_9 = 0 \\
&S(x^8_{10}) + y^8_{10} = 0 \\
&S(x^8_{11}) + y^8_{11} = 0 \\
&S(x^8_{15}) + y^8_{15} = 0 \\
&S(x^9_2) + y^9_2 = 0 \\
&S(x^9_4) + y^9_4 = 0 \\
&S(x^9_9) + y^9_9 = 0 \\
&S(x^9_{10}) + y^9_{10} = 0 \\
&S(x^9_{11}) + y^9_{11} = 0 \\
&S(x^9_{12}) + y^9_{12} = 0 \\
&S(x^9_{14}) + y^9_{14} = 0 \\
&S(x^{10}_1) + y^{10}_1 = 0 \\
&S(x^{10}_3) + y^{10}_3 = 0 \\
&S(x^{10}_4) + y^{10}_4 = 0 \\
&S(x^{10}_6) + y^{10}_6 = 0 \\
&S(x^{10}_7) + y^{10}_7 = 0 \\
&S(x^{10}_9) + y^{10}_9 = 0 \\
&S(x^{10}_{12}) + y^{10}_{12} = 0 \\
&S(x^{10}_{13}) + y^{10}_{13} = 0 \\
&S(x^{11}_0) + y^{11}_0 = 0 \\
&S(x^{11}_3) + y^{11}_3 = 0 \\
&S(x^{11}_4) + y^{11}_4 = 0 \\
&S(x^{11}_7) + y^{11}_7 = 0 \\
&S(x^{11}_8) + y^{11}_8 = 0 \\
&S(x^{11}_9) + y^{11}_9 = 0 \\
&S(x^{11}_{11}) + y^{11}_{11} = 0 \\
&S(x^{11}_{13}) + y^{11}_{13} = 0 \\
&S(x^{11}_{15}) + y^{11}_{15} = 0 \\
&S(x^{12}_0) + y^{12}_0 = 0 \\
&S(x^{12}_2) + y^{12}_2 = 0 \\
&S(x^{12}_6) + y^{12}_6 = 0 \\
&S(x^{12}_8) + y^{12}_8 = 0 \\
&S(x^{12}_9) + y^{12}_9 = 0 \\
&S(x^{12}_{15}) + y^{12}_{15} = 0 \\
&S(x^{13}_2) + y^{13}_2 = 0
\end{aligned}$$

$$S(x^{13}_4) + y^{13}_4 = 0$$

$$S(x^{13}_{11}) + y^{13}_{11} = 0$$

$$S(x^{14}_6) + y^{14}_6 = 0$$

$$S(x^{14}_9) + y^{14}_9 = 0$$

the 4 th Minimal Constraint set is:

$$[y^3_7] + [y^3_{10}] + x^4_8 + k1_{13} + k2_{13_1} + k3_{13_1} = 0$$

$$[y^4_1] + [y^4_{11}] + x^5_{13} + k1_3 + k2_{3_2} + k3_{3_2} = 0$$

$$[y^4_2] + y^4_8 + [y^4_{15}] + x^5_2 + k1_1 + k2_{1_2} + k3_{1_2} = 0$$

$$[y^4_4] + [y^4_{11}] + x^5_9 + k1_0 + k2_{0_2} + k3_{0_2} = 0$$

$$[y^5_0] + [y^5_{10}] + y^5_{13} + x^6_0 + k1_{11} + k2_{11_2} + k3_{11_2} = 0$$

$$[y^5_0] + [y^5_{10}] + x^6_{12} + k1_{11} + k2_{11_2} + k3_{11_2} = 0$$

$$y^5_2 + x^6_6 + k1_{15} + k2_{15_2} + k3_{15_2} = 0$$

$$y^5_3 + x^6_7 + k1_{12} + k2_{12_2} + k3_{12_2} = 0$$

$$y^5_3 + y^5_9 + x^6_{15} + k1_{12} + k2_{12_2} + k3_{12_2} = 0$$

$$[y^5_5] + [y^5_8] + x^6_{10} + k1_{10} + k2_{10_2} + k3_{10_2} = 0$$

$$[y^5_7] + [y^5_{10}] + x^6_8 + k1_{14} + k2_{14_2} + k3_{14_2} = 0$$

$$y^6_0 + x^7_4 + k1_3 + k2_{3_3} + k3_{3_3} = 0$$

$$[y^6_1] + [y^6_{11}] + [y^6_{14}] + x^7_1 + k1_5 + k2_{5_3} + k3_{5_3} = 0$$

$$[y^6_1] + x^7_5 + k1_5 + k2_{5_3} + k3_{5_3} = 0$$

$$y^6_2 + y^6_8 + y^6_{15} + x^7_2 + k1_7 + k2_{7_3} + k3_{7_3} = 0$$

$$y^6_2 + x^7_6 + k1_7 + k2_{7_3} + k3_{7_3} = 0$$

$$y^6_3 + y^6_9 + y^6_{12} + x^7_3 + k1_4 + k2_{4_3} + k3_{4_3} = 0$$

$$y^6_3 + x^7_7 + k1_4 + k2_{4_3} + k3_{4_3} = 0$$

$$y^6_6 + y^6_9 + x^7_{11} + k1_0 + k2_{0_3} + k3_{0_3} = 0$$

$$y^6_7 + y^6_{10} + x^7_8 + k1_6 + k2_{6_3} + k3_{6_3} = 0$$

$$y^7_0 + y^7_{10} + [y^7_{13}] + [x^8_0] + k1_{13} + k2_{13_3} + k3_{13_3} = 0$$

$$y^7_0 + x^8_4 + k1_{13} + k2_{13_3} + k3_{13_3} = 0$$

$$y^7_1 + x^8_5 + k1_{14} + k2_{14_3} + k3_{14_3} = 0$$

$$y^7_2 + x^8_6 + k1_{11} + k2_{11_3} + k3_{11_3} = 0$$

$$y^7_3 + y^7_9 + x^8_{15} + k1_{10} + k2_{10_3} + k3_{10_3} = 0$$

$$y^7_4 + y^7_{11} + x^8_9 + k1_{15} + k2_{15_3} + k3_{15_3} = 0$$

$$y^7_5 + y^7_8 + x^8_{10} + k1_8 + k2_{8_3} + k3_{8_3} = 0$$

$$y^7_6 + y^7_9 + x^8_{11} + k1_9 + k2_{9_3} + k3_{9_3} = 0$$

$$y^7_7 + y^7_{10} + x^8_8 + k1_{12} + k2_{12_3} + k3_{12_3} = 0$$

$$[y^8_0] + x^9_4 + k1_5 + k2_{5_4} + k3_{5_4} = 0$$

$$[y^8_0] + y^8_{10} + x^9_{12} + k1_5 + k2_{5_4} + k3_{5_4} = 0$$

$$y^8_2 + y^8_8 + y^8_{15} + x^9_2 + k1_3 + k2_{3_4} + k3_{3_4} = 0$$

$$y^8_2 + y^8_8 + x^9_{14} + k1_3 + k2_{3_4} + k3_{3_4} = 0$$

$$y^8_4 + y^8_{11} + x^9_9 + k1_7 + k2_{7_4} + k3_{7_4} = 0$$

$$y^8_5 + y^8_8 + x^9_{10} + k1_0 + k2_{0_4} + k3_{0_4} = 0$$

$$y^8_6 + y^8_9 + x^9_{11} + k1_1 + k2_{1_4} + k3_{1_4} = 0$$

$$y^9_0 + x^{10}_4 + k1_{14} + k2_{14_4} + k3_{14_4} = 0$$

$$y^9_0 + y^9_{10} + x^{10}_{12} + k1_{14} + k2_{14_4} + k3_{14_4} = 0$$

$$y^9_1 + y^9_{11} + y^9_{14} + x^{10}_1 + k1_{12} + k2_{12_4} + k3_{12_4} = 0$$

$$\begin{aligned}
&y^9_1 + y^9_{11} + x^{10}_{13} + k_{1,12} + k_{2,12,4} + k_{3,12,4} = 0 \\
&y^9_2 + x^{10}_6 + k_{1,13} + k_{2,13,4} + k_{3,13,4} = 0 \\
&y^9_3 + y^9_9 + y^9_{12} + x^{10}_3 + k_{1,8} + k_{2,8,4} + k_{3,8,4} = 0 \\
&y^9_3 + x^{10}_7 + k_{1,8} + k_{2,8,4} + k_{3,8,4} = 0 \\
&y^9_4 + y^9_{11} + x^{10}_9 + k_{1,11} + k_{2,11,4} + k_{3,11,4} = 0 \\
&y^{10}_0 + y^{10}_{10} + y^{10}_{13} + x^{11}_0 + k_{1,6} + k_{2,6,5} + k_{3,6,5} = 0 \\
&y^{10}_0 + x^{11}_4 + k_{1,6} + k_{2,6,5} + k_{3,6,5} = 0 \\
&y^{10}_1 + y^{10}_{11} + x^{11}_{13} + k_{1,4} + k_{2,4,5} + k_{3,4,5} = 0 \\
&y^{10}_3 + y^{10}_9 + y^{10}_{12} + x^{11}_3 + k_{1,0} + k_{2,0,5} + k_{3,0,5} = 0 \\
&y^{10}_3 + x^{11}_7 + k_{1,0} + k_{2,0,5} + k_{3,0,5} = 0 \\
&y^{10}_3 + y^{10}_9 + x^{11}_{15} + k_{1,0} + k_{2,0,5} + k_{3,0,5} = 0 \\
&y^{10}_4 + y^{10}_{11} + x^{11}_9 + k_{1,3} + k_{2,3,5} + k_{3,3,5} = 0 \\
&y^{10}_6 + y^{10}_9 + x^{11}_{11} + k_{1,7} + k_{2,7,5} + k_{3,7,5} = 0 \\
&y^{10}_7 + y^{10}_{10} + x^{11}_8 + k_{1,2} + k_{2,2,5} + k_{3,2,5} = 0 \\
&y^{11}_0 + y^{11}_{10} + y^{11}_{13} + x^{12}_0 + k_{1,12} + k_{2,12,5} + k_{3,12,5} = 0 \\
&y^{11}_2 + y^{11}_8 + y^{11}_{15} + x^{12}_2 + k_{1,14} + k_{2,14,5} + k_{3,14,5} = 0 \\
&y^{11}_2 + x^{12}_6 + k_{1,14} + k_{2,14,5} + k_{3,14,5} = 0 \\
&y^{11}_3 + y^{11}_9 + x^{12}_{15} + k_{1,9} + k_{2,9,5} + k_{3,9,5} = 0 \\
&y^{11}_4 + y^{11}_{11} + x^{12}_9 + k_{1,13} + k_{2,13,5} + k_{3,13,5} = 0 \\
&y^{11}_7 + y^{11}_{10} + x^{12}_8 + k_{1,8} + k_{2,8,5} + k_{3,8,5} = 0 \\
&y^{12}_0 + x^{13}_4 + k_{1,4} + k_{2,4,6} + k_{3,4,6} = 0 \\
&y^{12}_2 + y^{12}_8 + y^{12}_{15} + x^{13}_2 + k_{1,6} + k_{2,6,6} + k_{3,6,6} = 0 \\
&y^{12}_6 + y^{12}_9 + x^{13}_{11} + k_{1,3} + k_{2,3,6} + k_{3,3,6} = 0 \\
&y^{13}_2 + x^{14}_6 + k_{1,12} + k_{2,12,6} + k_{3,12,6} = 0 \\
&y^{13}_4 + y^{13}_{11} + x^{14}_9 + k_{1,14} + k_{2,14,6} + k_{3,14,6} = 0 \\
&y^{14}_6 + y^{14}_9 + [x^{15}_{11}] + k_{1,5} + k_{2,5,7} + k_{3,5,7} = 0 \\
&S(x^4_8) + y^4_8 = 0 \\
&S(x^5_2) + y^5_2 = 0 \\
&S(x^5_9) + y^5_9 = 0 \\
&S(x^5_{13}) + y^5_{13} = 0 \\
&S(x^6_0) + y^6_0 = 0 \\
&S(x^6_6) + y^6_6 = 0 \\
&S(x^6_7) + y^6_7 = 0 \\
&S(x^6_8) + y^6_8 = 0 \\
&S(x^6_{10}) + y^6_{10} = 0 \\
&S(x^6_{12}) + y^6_{12} = 0 \\
&S(x^6_{15}) + y^6_{15} = 0 \\
&S(x^7_1) + y^7_1 = 0 \\
&S(x^7_2) + y^7_2 = 0 \\
&S(x^7_3) + y^7_3 = 0 \\
&S(x^7_4) + y^7_4 = 0 \\
&S(x^7_5) + y^7_5 = 0 \\
&S(x^7_6) + y^7_6 = 0 \\
&S(x^7_7) + y^7_7 = 0
\end{aligned}$$

$$\begin{aligned}
&S(x^{7_8}) + y^{7_8} = 0 \\
&S(x^{7_{11}}) + y^{7_{11}} = 0 \\
&S(x^{8_4}) + y^{8_4} = 0 \\
&S(x^{8_5}) + y^{8_5} = 0 \\
&S(x^{8_6}) + y^{8_6} = 0 \\
&S(x^{8_8}) + y^{8_8} = 0 \\
&S(x^{8_9}) + y^{8_9} = 0 \\
&S(x^{8_{10}}) + y^{8_{10}} = 0 \\
&S(x^{8_{11}}) + y^{8_{11}} = 0 \\
&S(x^{8_{15}}) + y^{8_{15}} = 0 \\
&S(x^{9_2}) + y^{9_2} = 0 \\
&S(x^{9_4}) + y^{9_4} = 0 \\
&S(x^{9_9}) + y^{9_9} = 0 \\
&S(x^{9_{10}}) + y^{9_{10}} = 0 \\
&S(x^{9_{11}}) + y^{9_{11}} = 0 \\
&S(x^{9_{12}}) + y^{9_{12}} = 0 \\
&S(x^{9_{14}}) + y^{9_{14}} = 0 \\
&S(x^{10_1}) + y^{10_1} = 0 \\
&S(x^{10_3}) + y^{10_3} = 0 \\
&S(x^{10_4}) + y^{10_4} = 0 \\
&S(x^{10_6}) + y^{10_6} = 0 \\
&S(x^{10_7}) + y^{10_7} = 0 \\
&S(x^{10_9}) + y^{10_9} = 0 \\
&S(x^{10_{12}}) + y^{10_{12}} = 0 \\
&S(x^{10_{13}}) + y^{10_{13}} = 0 \\
&S(x^{11_0}) + y^{11_0} = 0 \\
&S(x^{11_3}) + y^{11_3} = 0 \\
&S(x^{11_4}) + y^{11_4} = 0 \\
&S(x^{11_7}) + y^{11_7} = 0 \\
&S(x^{11_8}) + y^{11_8} = 0 \\
&S(x^{11_9}) + y^{11_9} = 0 \\
&S(x^{11_{11}}) + y^{11_{11}} = 0 \\
&S(x^{11_{13}}) + y^{11_{13}} = 0 \\
&S(x^{11_{15}}) + y^{11_{15}} = 0 \\
&S(x^{12_0}) + y^{12_0} = 0 \\
&S(x^{12_2}) + y^{12_2} = 0 \\
&S(x^{12_6}) + y^{12_6} = 0 \\
&S(x^{12_8}) + y^{12_8} = 0 \\
&S(x^{12_9}) + y^{12_9} = 0 \\
&S(x^{12_{15}}) + y^{12_{15}} = 0 \\
&S(x^{13_2}) + y^{13_2} = 0 \\
&S(x^{13_4}) + y^{13_4} = 0 \\
&S(x^{13_{11}}) + y^{13_{11}} = 0 \\
&S(x^{14_6}) + y^{14_6} = 0
\end{aligned}$$

$$S(x^{14}_9) + y^{14}_9 = 0$$

the 5 th Minimal Constraint set is:

$$[y^4_4] + [y^4_{11}] + x^5_9 + k1_0 + k2_0_2 + k3_0_2 = 0$$

$$[y^5_6] + y^5_9 + [x^6_{11}] + k1_8 + k2_8_2 + k3_8_2 = 0$$

$$S(x^5_9) + y^5_9 = 0$$

the 6 th Minimal Constraint set is:

$$y^0_1 + y^0_{11} + [y^0_{14}] + [x^1_1] + k1_1 + k2_1_0 + k3_1_0 = 0$$

$$y^0_1 + y^0_{11} + x^1_{13} + k1_1 + k2_1_0 + k3_1_0 = 0$$

$$[y^0_5] + [y^0_8] + x^1_{10} + k1_5 + k2_5_0 + k3_5_0 = 0$$

$$y^1_0 + y^1_{10} + y^1_{13} + x^2_0 + k1_9 + k2_9_0 + k3_9_0 = 0$$

$$y^1_0 + x^2_4 + k1_9 + k2_9_0 + k3_9_0 = 0$$

$$y^1_3 + x^2_7 + k1_{13} + k2_{13}_0 + k3_{13}_0 = 0$$

$$y^1_3 + y^1_9 + x^2_{15} + k1_{13} + k2_{13}_0 + k3_{13}_0 = 0$$

$$[y^1_6] + y^1_9 + [x^2_{11}] + k1_{12} + k2_{12}_0 + k3_{12}_0 = 0$$

$$y^2_0 + y^2_{10} + [y^2_{13}] + [x^3_0] + k1_1 + k2_1_1 + k3_1_1 = 0$$

$$y^2_2 + y^2_8 + y^2_{15} + x^3_2 + k1_0 + k2_0_1 + k3_0_1 = 0$$

$$y^2_2 + y^2_8 + x^3_{14} + k1_0 + k2_0_1 + k3_0_1 = 0$$

$$y^2_4 + [y^2_{11}] + [x^3_9] + k1_2 + k2_2_1 + k3_2_1 = 0$$

$$y^2_7 + y^2_{10} + x^3_8 + k1_3 + k2_3_1 + k3_3_1 = 0$$

$$[y^3_1] + y^3_{11} + y^3_{14} + [x^4_1] + k1_{11} + k2_{11}_1 + k3_{11}_1 = 0$$

$$[y^3_1] + y^3_{11} + [x^4_{13}] + k1_{11} + k2_{11}_1 + k3_{11}_1 = 0$$

$$y^3_2 + y^3_8 + [y^3_{15}] + [x^4_2] + k1_9 + k2_9_1 + k3_9_1 = 0$$

$$S(x^1_{10}) + y^1_{10} = 0$$

$$S(x^1_{13}) + y^1_{13} = 0$$

$$S(x^2_0) + y^2_0 = 0$$

$$S(x^2_4) + y^2_4 = 0$$

$$S(x^2_7) + y^2_7 = 0$$

$$S(x^2_{15}) + y^2_{15} = 0$$

$$S(x^3_2) + y^3_2 = 0$$

$$S(x^3_8) + y^3_8 = 0$$

$$S(x^3_{14}) + y^3_{14} = 0$$

the 7 th Minimal Constraint set is:

$$y^0_1 + y^0_{11} + [y^0_{14}] + [x^1_1] + k1_1 + k2_1_0 + k3_1_0 = 0$$

$$y^0_1 + y^0_{11} + x^1_{13} + k1_1 + k2_1_0 + k3_1_0 = 0$$

$$[y^0_5] + [y^0_8] + x^1_{10} + k1_5 + k2_5_0 + k3_5_0 = 0$$

$$y^1_0 + y^1_{10} + y^1_{13} + x^2_0 + k1_9 + k2_9_0 + k3_9_0 = 0$$

$$y^1_0 + x^2_4 + k1_9 + k2_9_0 + k3_9_0 = 0$$

$$y^1_3 + x^2_7 + k1_{13} + k2_{13}_0 + k3_{13}_0 = 0$$

$$y^1_3 + y^1_9 + x^2_{15} + k1_{13} + k2_{13}_0 + k3_{13}_0 = 0$$

$$[y^1_6] + y^1_9 + [x^2_{11}] + k1_{12} + k2_{12}_0 + k3_{12}_0 = 0$$

$$y^2_0 + y^2_{10} + [y^2_{13}] + [x^3_0] + k1_1 + k2_1_1 + k3_1_1 = 0$$

$$y^2_2 + y^2_8 + y^2_{15} + x^3_2 + k1_0 + k2_0_1 + k3_0_1 = 0$$

$$y^2_2 + x^3_6 + k1_0 + k2_0_1 + k3_0_1 = 0$$

$$y^2_4 + [y^2_{11}] + [x^3_9] + k1_2 + k2_2_1 + k3_2_1 = 0$$

$$\begin{aligned}
&[y^2_5] + y^2_8 + [x^3_{10}] + k1_6 + k2_{6_1} + k3_{6_1} = 0 \\
&y^2_7 + y^2_{10} + x^3_8 + k1_3 + k2_{3_1} + k3_{3_1} = 0 \\
&y^3_2 + y^3_8 + [y^3_{15}] + [x^4_2] + k1_9 + k2_{9_1} + k3_{9_1} = 0 \\
&y^3_6 + [y^3_9] + [x^4_{11}] + k1_{10} + k2_{10_1} + k3_{10_1} = 0 \\
&S(x^1_{10}) + y^1_{10} = 0 \\
&S(x^1_{13}) + y^1_{13} = 0 \\
&S(x^2_0) + y^2_0 = 0 \\
&S(x^2_4) + y^2_4 = 0 \\
&S(x^2_7) + y^2_7 = 0 \\
&S(x^2_{15}) + y^2_{15} = 0 \\
&S(x^3_2) + y^3_2 = 0 \\
&S(x^3_6) + y^3_6 = 0 \\
&S(x^3_8) + y^3_8 = 0
\end{aligned}$$

the 8 th Minimal Constraint set is:

$$\begin{aligned}
&[y^3_7] + [y^3_{10}] + x^4_8 + k1_{13} + k2_{13_1} + k3_{13_1} = 0 \\
&[y^4_2] + y^4_8 + [y^4_{15}] + x^5_2 + k1_1 + k2_{1_2} + k3_{1_2} = 0 \\
&y^5_2 + [y^5_8] + [x^6_{14}] + k1_{15} + k2_{15_2} + k3_{15_2} = 0 \\
&S(x^4_8) + y^4_8 = 0 \\
&S(x^5_2) + y^5_2 = 0
\end{aligned}$$

the 9 th Minimal Constraint set is:

$$\begin{aligned}
&[y^1_1] + y^1_{11} + [y^1_{14}] + x^2_1 + k1_{15} + k2_{15_0} + k3_{15_0} = 0 \\
&[y^1_1] + y^1_{11} + [x^2_{13}] + k1_{15} + k2_{15_0} + k3_{15_0} = 0 \\
&y^2_1 + x^3_5 + k1_7 + k2_{7_1} + k3_{7_1} = 0 \\
&y^3_2 + x^4_6 + k1_9 + k2_{9_1} + k3_{9_1} = 0 \\
&y^3_2 + y^3_8 + x^4_{14} + k1_9 + k2_{9_1} + k3_{9_1} = 0 \\
&y^3_5 + y^3_8 + x^4_{10} + k1_{12} + k2_{12_1} + k3_{12_1} = 0 \\
&[y^4_1] + [y^4_{11}] + y^4_{14} + x^5_1 + k1_3 + k2_{3_2} + k3_{3_2} = 0 \\
&[y^4_3] + y^4_9 + [x^5_{15}] + k1_6 + k2_{6_2} + k3_{6_2} = 0 \\
&y^4_6 + y^4_9 + x^5_{11} + k1_2 + k2_{2_2} + k3_{2_2} = 0 \\
&[y^4_7] + y^4_{10} + [x^5_8] + k1_5 + k2_{5_2} + k3_{5_2} = 0 \\
&y^5_1 + y^5_{11} + [y^5_{14}] + [x^6_1] + k1_{13} + k2_{13_2} + k3_{13_2} = 0 \\
&S(x^2_1) + y^2_1 = 0 \\
&S(x^3_5) + y^3_5 = 0 \\
&S(x^4_6) + y^4_6 = 0 \\
&S(x^4_{10}) + y^4_{10} = 0 \\
&S(x^4_{14}) + y^4_{14} = 0 \\
&S(x^5_1) + y^5_1 = 0 \\
&S(x^5_{11}) + y^5_{11} = 0
\end{aligned}$$

the 10 th Minimal Constraint set is:

$$\begin{aligned}
&[y^3_0] + [y^3_{10}] + [y^3_{13}] + x^4_0 + k1_{15} + k2_{15_1} + k3_{15_1} = 0 \\
&y^4_0 + y^4_{10} + [y^4_{13}] + [x^5_0] + k1_7 + k2_{7_2} + k3_{7_2} = 0 \\
&[y^4_7] + y^4_{10} + [x^5_8] + k1_5 + k2_{5_2} + k3_{5_2} = 0 \\
&S(x^4_0) + y^4_0 = 0
\end{aligned}$$

the 11 th Minimal Constraint set is:

$$\begin{aligned}
&y^{0_1} + y^{0_{11}} + [y^{0_{14}}] + [x^{1_1}] + k_{1_1} + k_{2_1_0} + k_{3_1_0} = 0 \\
&y^{0_1} + y^{0_{11}} + x^{1_{13}} + k_{1_1} + k_{2_1_0} + k_{3_1_0} = 0 \\
&[y^{0_5}] + [y^{0_8}] + x^{1_{10}} + k_{1_5} + k_{2_5_0} + k_{3_5_0} = 0 \\
&y^{1_0} + y^{1_{10}} + y^{1_{13}} + x^{2_0} + k_{1_9} + k_{2_9_0} + k_{3_9_0} = 0 \\
&y^{1_0} + x^{2_4} + k_{1_9} + k_{2_9_0} + k_{3_9_0} = 0 \\
&y^{2_0} + x^{3_4} + k_{1_1} + k_{2_1_1} + k_{3_1_1} = 0 \\
&y^{2_4} + [y^{2_{11}}] + [x^{3_9}] + k_{1_2} + k_{2_2_1} + k_{3_2_1} = 0 \\
&[y^{3_1}] + y^{3_{11}} + [x^{4_{13}}] + k_{1_{11}} + k_{2_{11_1}} + k_{3_{11_1}} = 0 \\
&y^{3_4} + y^{3_{11}} + x^{4_9} + k_{1_8} + k_{2_8_1} + k_{3_8_1} = 0 \\
&[y^{4_3}] + y^{4_9} + [x^{5_{15}}] + k_{1_6} + k_{2_6_2} + k_{3_6_2} = 0 \\
&S(x^{1_{10}}) + y^{1_{10}} = 0 \\
&S(x^{1_{13}}) + y^{1_{13}} = 0 \\
&S(x^{2_0}) + y^{2_0} = 0 \\
&S(x^{2_4}) + y^{2_4} = 0 \\
&S(x^{3_4}) + y^{3_4} = 0 \\
&S(x^{4_9}) + y^{4_9} = 0
\end{aligned}$$

the 12 th Minimal Constraint set is:

$$\begin{aligned}
&[y^{3_7}] + [y^{3_{10}}] + x^{4_8} + k_{1_{13}} + k_{2_{13_1}} + k_{3_{13_1}} = 0 \\
&[y^{4_5}] + y^{4_8} + [x^{5_{10}}] + k_{1_4} + k_{2_4_2} + k_{3_4_2} = 0 \\
&S(x^{4_8}) + y^{4_8} = 0
\end{aligned}$$

the 13 th Minimal Constraint set is:

$$\begin{aligned}
&[y^{3_7}] + [y^{3_{10}}] + x^{4_8} + k_{1_{13}} + k_{2_{13_1}} + k_{3_{13_1}} = 0 \\
&[y^{4_2}] + y^{4_8} + [x^{5_{14}}] + k_{1_1} + k_{2_1_2} + k_{3_1_2} = 0 \\
&S(x^{4_8}) + y^{4_8} = 0
\end{aligned}$$

the 14 th Minimal Constraint set is:

$$\begin{aligned}
&[y^{0_2}] + [y^{0_8}] + [y^{0_{15}}] + x^{1_2} + k_{1_2} + k_{2_2_0} + k_{3_2_0} = 0 \\
&[y^{0_5}] + [y^{0_8}] + x^{1_{10}} + k_{1_5} + k_{2_5_0} + k_{3_5_0} = 0 \\
&y^{1_0} + x^{2_4} + k_{1_9} + k_{2_9_0} + k_{3_9_0} = 0 \\
&y^{1_0} + y^{1_{10}} + x^{2_{12}} + k_{1_9} + k_{2_9_0} + k_{3_9_0} = 0 \\
&y^{1_2} + x^{2_6} + k_{1_8} + k_{2_8_0} + k_{3_8_0} = 0 \\
&y^{2_3} + y^{2_9} + y^{2_{12}} + [x^{3_3}] + k_{1_5} + k_{2_5_1} + k_{3_5_1} = 0 \\
&y^{2_3} + [x^{3_7}] + k_{1_5} + k_{2_5_1} + k_{3_5_1} = 0 \\
&y^{2_4} + [y^{2_{11}}] + [x^{3_9}] + k_{1_2} + k_{2_2_1} + k_{3_2_1} = 0 \\
&y^{2_6} + y^{2_9} + x^{3_{11}} + k_{1_4} + k_{2_4_1} + k_{3_4_1} = 0 \\
&[y^{3_1}] + y^{3_{11}} + [x^{4_{13}}] + k_{1_{11}} + k_{2_{11_1}} + k_{3_{11_1}} = 0 \\
&S(x^{1_2}) + y^{1_2} = 0 \\
&S(x^{1_{10}}) + y^{1_{10}} = 0 \\
&S(x^{2_4}) + y^{2_4} = 0 \\
&S(x^{2_6}) + y^{2_6} = 0 \\
&S(x^{2_{12}}) + y^{2_{12}} = 0 \\
&S(x^{3_{11}}) + y^{3_{11}} = 0
\end{aligned}$$

the 15 th Minimal Constraint set is:

$$\begin{aligned}
&[y^{0_5}] + [y^{0_8}] + x^{1_{10}} + k_{1_5} + k_{2_5_0} + k_{3_5_0} = 0 \\
&y^{1_0} + x^{2_4} + k_{1_9} + k_{2_9_0} + k_{3_9_0} = 0
\end{aligned}$$

$$y^{1_0} + y^{1_{10}} + x^{2_{12}} + k_{1_9} + k_{2_{9_0}} + k_{3_{9_0}} = 0$$

$$y^{2_3} + y^{2_9} + y^{2_{12}} + [x^{3_3}] + k_{1_5} + k_{2_{5_1}} + k_{3_{5_1}} = 0$$

$$y^{2_3} + y^{2_9} + [x^{3_{15}}] + k_{1_5} + k_{2_{5_1}} + k_{3_{5_1}} = 0$$

$$y^{2_4} + [y^{2_{11}}] + [x^{3_9}] + k_{1_2} + k_{2_{2_1}} + k_{3_{2_1}} = 0$$

$$S(x^{1_{10}}) + y^{1_{10}} = 0$$

$$S(x^{2_4}) + y^{2_4} = 0$$

$$S(x^{2_{12}}) + y^{2_{12}} = 0$$

the 16 th Minimal Constraint set is:

$$y^{2_0} + y^{2_{10}} + [y^{2_{13}}] + [x^{3_0}] + k_{1_1} + k_{2_{1_1}} + k_{3_{1_1}} = 0$$

$$y^{2_0} + y^{2_{10}} + x^{3_{12}} + k_{1_1} + k_{2_{1_1}} + k_{3_{1_1}} = 0$$

$$[y^{3_3}] + [y^{3_9}] + y^{3_{12}} + [x^{4_3}] + k_{1_{14}} + k_{2_{14_1}} + k_{3_{14_1}} = 0$$

$$S(x^{3_{12}}) + y^{3_{12}} = 0$$

the 17 th Minimal Constraint set is:

$$[y^{1_1}] + y^{1_{11}} + [y^{1_{14}}] + x^{2_1} + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} = 0$$

$$[y^{1_1}] + y^{1_{11}} + [x^{2_{13}}] + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} = 0$$

$$y^{2_1} + [y^{2_{11}}] + [x^{3_{13}}] + k_{1_7} + k_{2_{7_1}} + k_{3_{7_1}} = 0$$

$$S(x^{2_1}) + y^{2_1} = 0$$

the 18 th Minimal Constraint set is:

$$[y^{0_2}] + [x^{1_6}] + k_{1_2} + k_{2_{2_0}} + k_{3_{2_0}} = 0$$

the 19 th Minimal Constraint set is:

$$[y^{0_2}] + [y^{0_8}] + [x^{1_{14}}] + k_{1_2} + k_{2_{2_0}} + k_{3_{2_0}} = 0$$

the 20 th Minimal Constraint set is:

$$[y^{1_1}] + [x^{2_5}] + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} = 0$$

the 21 th Minimal Constraint set is:

$$[y^{3_0}] + [x^{4_4}] + k_{1_{15}} + k_{2_{15_1}} + k_{3_{15_1}} = 0$$

the 22 th Minimal Constraint set is:

$$[y^{3_0}] + [y^{3_{10}}] + [x^{4_{12}}] + k_{1_{15}} + k_{2_{15_1}} + k_{3_{15_1}} = 0$$

the 23 th Minimal Constraint set is:

$$[y^{3_1}] + [x^{4_5}] + k_{1_{11}} + k_{2_{11_1}} + k_{3_{11_1}} = 0$$

the 24 th Minimal Constraint set is:

$$[y^{3_3}] + [x^{4_7}] + k_{1_{14}} + k_{2_{14_1}} + k_{3_{14_1}} = 0$$

the 25 th Minimal Constraint set is:

$$[y^{3_3}] + [y^{3_9}] + [x^{4_{15}}] + k_{1_{14}} + k_{2_{14_1}} + k_{3_{14_1}} = 0$$

the 26 th Minimal Constraint set is:

$$[y^{4_1}] + [x^{5_5}] + k_{1_3} + k_{2_{3_2}} + k_{3_{3_2}} = 0$$

the 27 th Minimal Constraint set is:

$$[y^{4_2}] + [x^{5_6}] + k_{1_1} + k_{2_{1_2}} + k_{3_{1_2}} = 0$$

the 28 th Minimal Constraint set is:

$$[y^{4_3}] + [x^{5_7}] + k_{1_6} + k_{2_{6_2}} + k_{3_{6_2}} = 0$$

the 29 th Minimal Constraint set is:

$$[y^{5_0}] + [x^{6_4}] + k_{1_{11}} + k_{2_{11_2}} + k_{3_{11_2}} = 0$$

the 30 th Minimal Constraint set is:

$$[y^{6_1}] + [y^{6_{11}}] + [x^{7_{13}}] + k_{1_5} + k_{2_{5_3}} + k_{3_{5_3}} = 0$$