# Rank-65613 over GF(32)

January 15, 2021

## The equation

The equation of the surface is :

$$X_1^3 + X_3^3 + X_0^2 X_3 + X_0 X_1 X_2 = 0$$

( 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0 )
The point rank of the equation over GF(32) is -2112814011

## General information

| | |
|---|---:|
| Number of lines | 5 |
| Number of points | 1089 |
| Number of singular points | 2 |
| Number of Eckardt points | 1 |
| Number of double points | 4 |
| Number of single points | 154 |
| Number of points off lines | 930 |
| Number of Hesse planes | 0 |
| Number of axes | 0 |
| Type of points on lines | $33^5$ |
| Type of lines on points | $3, 2^4, 1^{154}, 0^{930}$ |

**Singular Points**

The surface has 2 singular points:

$0: P_2 = \mathbf{P}(0,0,1,0) = \mathbf{P}(0,0,1,0)$
$1: P_{1059} = \mathbf{P}(1,0,0,1) = \mathbf{P}(1,0,0,1)$

## The 5 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{1024} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{1024} = \mathbf{Pl}(0,0,1,0,0,0)_2$$

$$\ell_1 = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{34848} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{34848} = \mathbf{Pl}(0,1,1,0,0,0)_{34}$$

$$\ell_2 = \begin{bmatrix} 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{1082401} = \begin{bmatrix} 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{1082401} = \mathbf{Pl}(0,1,0,0,0,1)_{34881}$$

$$\ell_3 = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}_{1089} = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}_{1089} = \mathbf{Pl}(1,1,0,0,1,1)_{68609}$$

$$\ell_4 = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}_{33857} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}_{33857} = \mathbf{Pl}(1,1,1,1,1,0)_{5058}$$

Rank of lines: ( 1024, 34848, 1082401, 1089, 33857 )
Rank of points on Klein quadric: ( 2, 34, 34881, 68609, 5058 )

## Eckardt Points

The surface has 1 Eckardt points:
$0 : P_2 = \mathbf{P}(0,0,1,0) = \mathbf{P}(0,0,1,0)$.

## Double Points

The surface has 4 Double points:
The double points on the surface are:

$P_{36} = (1,0,1,0) = \ell_0 \cap \ell_3$                    $P_{2114} = (0,1,1,1) = \ell_2 \cap \ell_4$
$P_{1059} = (1,0,0,1) = \ell_1 \cap \ell_4$
$P_{1090} = (0,1,0,1) = \ell_2 \cap \ell_3$

## Single Points

The surface has 154 single points:
The single points on the surface are:

$0 : P_0 = (1,0,0,0)$ lies on line $\ell_0$                    $18 : P_{53} = (18,0,1,0)$ lies on line $\ell_0$
$1 : P_4 = (1,1,1,1)$ lies on line $\ell_3$                    $19 : P_{54} = (19,0,1,0)$ lies on line $\ell_0$
$2 : P_{37} = (2,0,1,0)$ lies on line $\ell_0$                    $20 : P_{55} = (20,0,1,0)$ lies on line $\ell_0$
$3 : P_{38} = (3,0,1,0)$ lies on line $\ell_0$                    $21 : P_{56} = (21,0,1,0)$ lies on line $\ell_0$
$4 : P_{39} = (4,0,1,0)$ lies on line $\ell_0$                    $22 : P_{57} = (22,0,1,0)$ lies on line $\ell_0$
$5 : P_{40} = (5,0,1,0)$ lies on line $\ell_0$                    $23 : P_{58} = (23,0,1,0)$ lies on line $\ell_0$
$6 : P_{41} = (6,0,1,0)$ lies on line $\ell_0$                    $24 : P_{59} = (24,0,1,0)$ lies on line $\ell_0$
$7 : P_{42} = (7,0,1,0)$ lies on line $\ell_0$                    $25 : P_{60} = (25,0,1,0)$ lies on line $\ell_0$
$8 : P_{43} = (8,0,1,0)$ lies on line $\ell_0$                    $26 : P_{61} = (26,0,1,0)$ lies on line $\ell_0$
$9 : P_{44} = (9,0,1,0)$ lies on line $\ell_0$                    $27 : P_{62} = (27,0,1,0)$ lies on line $\ell_0$
$10 : P_{45} = (10,0,1,0)$ lies on line $\ell_0$                    $28 : P_{63} = (28,0,1,0)$ lies on line $\ell_0$
$11 : P_{46} = (11,0,1,0)$ lies on line $\ell_0$                    $29 : P_{64} = (29,0,1,0)$ lies on line $\ell_0$
$12 : P_{47} = (12,0,1,0)$ lies on line $\ell_0$                    $30 : P_{65} = (30,0,1,0)$ lies on line $\ell_0$
$13 : P_{48} = (13,0,1,0)$ lies on line $\ell_0$                    $31 : P_{66} = (31,0,1,0)$ lies on line $\ell_0$
$14 : P_{49} = (14,0,1,0)$ lies on line $\ell_0$                    $32 : P_{68} = (1,1,1,0)$ lies on line $\ell_4$
$15 : P_{50} = (15,0,1,0)$ lies on line $\ell_0$                    $33 : P_{2083} = (1,0,1,1)$ lies on line $\ell_1$
$16 : P_{51} = (16,0,1,0)$ lies on line $\ell_0$                    $34 : P_{3106} = (1,0,2,1)$ lies on line $\ell_1$
$17 : P_{52} = (17,0,1,0)$ lies on line $\ell_0$                    $35 : P_{3137} = (0,1,2,1)$ lies on line $\ell_2$

$36: P_{3139} = (2, 1, 2, 1)$ lies on line $\ell_3$

$37: P_{3172} = (3, 2, 2, 1)$ lies on line $\ell_4$

$38: P_{4130} = (1, 0, 3, 1)$ lies on line $\ell_1$

$39: P_{4161} = (0, 1, 3, 1)$ lies on line $\ell_2$

$40: P_{4164} = (3, 1, 3, 1)$ lies on line $\ell_3$

$41: P_{4227} = (2, 3, 3, 1)$ lies on line $\ell_4$

$42: P_{5154} = (1, 0, 4, 1)$ lies on line $\ell_1$

$43: P_{5185} = (0, 1, 4, 1)$ lies on line $\ell_2$

$44: P_{5189} = (4, 1, 4, 1)$ lies on line $\ell_3$

$45: P_{5286} = (5, 4, 4, 1)$ lies on line $\ell_4$

$46: P_{6178} = (1, 0, 5, 1)$ lies on line $\ell_1$

$47: P_{6209} = (0, 1, 5, 1)$ lies on line $\ell_2$

$48: P_{6214} = (5, 1, 5, 1)$ lies on line $\ell_3$

$49: P_{6341} = (4, 5, 5, 1)$ lies on line $\ell_4$

$50: P_{7202} = (1, 0, 6, 1)$ lies on line $\ell_1$

$51: P_{7233} = (0, 1, 6, 1)$ lies on line $\ell_2$

$52: P_{7239} = (6, 1, 6, 1)$ lies on line $\ell_3$

$53: P_{7400} = (7, 6, 6, 1)$ lies on line $\ell_4$

$54: P_{8226} = (1, 0, 7, 1)$ lies on line $\ell_1$

$55: P_{8257} = (0, 1, 7, 1)$ lies on line $\ell_2$

$56: P_{8264} = (7, 1, 7, 1)$ lies on line $\ell_3$

$57: P_{8455} = (6, 7, 7, 1)$ lies on line $\ell_4$

$58: P_{9250} = (1, 0, 8, 1)$ lies on line $\ell_1$

$59: P_{9281} = (0, 1, 8, 1)$ lies on line $\ell_2$

$60: P_{9289} = (8, 1, 8, 1)$ lies on line $\ell_3$

$61: P_{9514} = (9, 8, 8, 1)$ lies on line $\ell_4$

$62: P_{10274} = (1, 0, 9, 1)$ lies on line $\ell_1$

$63: P_{10305} = (0, 1, 9, 1)$ lies on line $\ell_2$

$64: P_{10314} = (9, 1, 9, 1)$ lies on line $\ell_3$

$65: P_{10569} = (8, 9, 9, 1)$ lies on line $\ell_4$

$66: P_{11298} = (1, 0, 10, 1)$ lies on line $\ell_1$

$67: P_{11329} = (0, 1, 10, 1)$ lies on line $\ell_2$

$68: P_{11339} = (10, 1, 10, 1)$ lies on line $\ell_3$

$69: P_{11628} = (11, 10, 10, 1)$ lies on line $\ell_4$

$70: P_{12322} = (1, 0, 11, 1)$ lies on line $\ell_1$

$71: P_{12353} = (0, 1, 11, 1)$ lies on line $\ell_2$

$72: P_{12364} = (11, 1, 11, 1)$ lies on line $\ell_3$

$73: P_{12683} = (10, 11, 11, 1)$ lies on line $\ell_4$

$74: P_{13346} = (1, 0, 12, 1)$ lies on line $\ell_1$

$75: P_{13377} = (0, 1, 12, 1)$ lies on line $\ell_2$

$76: P_{13389} = (12, 1, 12, 1)$ lies on line $\ell_3$

$77: P_{13742} = (13, 12, 12, 1)$ lies on line $\ell_4$

$78: P_{14370} = (1, 0, 13, 1)$ lies on line $\ell_1$

$79: P_{14401} = (0, 1, 13, 1)$ lies on line $\ell_2$

$80: P_{14414} = (13, 1, 13, 1)$ lies on line $\ell_3$

$81: P_{14797} = (12, 13, 13, 1)$ lies on line $\ell_4$

$82: P_{15394} = (1, 0, 14, 1)$ lies on line $\ell_1$

$83: P_{15425} = (0, 1, 14, 1)$ lies on line $\ell_2$

$84: P_{15439} = (14, 1, 14, 1)$ lies on line $\ell_3$

$85: P_{15856} = (15, 14, 14, 1)$ lies on line $\ell_4$

$86: P_{16418} = (1, 0, 15, 1)$ lies on line $\ell_1$

$87: P_{16449} = (0, 1, 15, 1)$ lies on line $\ell_2$

$88: P_{16464} = (15, 1, 15, 1)$ lies on line $\ell_3$

$89: P_{16911} = (14, 15, 15, 1)$ lies on line $\ell_4$

$90: P_{17442} = (1, 0, 16, 1)$ lies on line $\ell_1$

$91: P_{17473} = (0, 1, 16, 1)$ lies on line $\ell_2$

$92: P_{17489} = (16, 1, 16, 1)$ lies on line $\ell_3$

$93: P_{17970} = (17, 16, 16, 1)$ lies on line $\ell_4$

$94: P_{18466} = (1, 0, 17, 1)$ lies on line $\ell_1$

$95: P_{18497} = (0, 1, 17, 1)$ lies on line $\ell_2$

$96: P_{18514} = (17, 1, 17, 1)$ lies on line $\ell_3$

$97: P_{19025} = (16, 17, 17, 1)$ lies on line $\ell_4$

$98: P_{19490} = (1, 0, 18, 1)$ lies on line $\ell_1$

$99: P_{19521} = (0, 1, 18, 1)$ lies on line $\ell_2$

$100: P_{19539} = (18, 1, 18, 1)$ lies on line $\ell_3$

$101: P_{20084} = (19, 18, 18, 1)$ lies on line $\ell_4$

$102: P_{20514} = (1, 0, 19, 1)$ lies on line $\ell_1$

$103: P_{20545} = (0, 1, 19, 1)$ lies on line $\ell_2$

$104: P_{20564} = (19, 1, 19, 1)$ lies on line $\ell_3$

$105: P_{21139} = (18, 19, 19, 1)$ lies on line $\ell_4$

$106: P_{21538} = (1, 0, 20, 1)$ lies on line $\ell_1$

$107: P_{21569} = (0, 1, 20, 1)$ lies on line $\ell_2$

$108: P_{21589} = (20, 1, 20, 1)$ lies on line $\ell_3$

$109: P_{22198} = (21, 20, 20, 1)$ lies on line $\ell_4$

$110: P_{22562} = (1, 0, 21, 1)$ lies on line $\ell_1$

$111: P_{22593} = (0, 1, 21, 1)$ lies on line $\ell_2$

$112: P_{22614} = (21, 1, 21, 1)$ lies on line $\ell_3$

$113: P_{23253} = (20, 21, 21, 1)$ lies on line $\ell_4$

$114: P_{23586} = (1, 0, 22, 1)$ lies on line $\ell_1$

$115: P_{23617} = (0, 1, 22, 1)$ lies on line $\ell_2$

$116: P_{23639} = (22, 1, 22, 1)$ lies on line $\ell_3$

$117: P_{24312} = (23, 22, 22, 1)$ lies on line $\ell_4$

$118: P_{24610} = (1, 0, 23, 1)$ lies on line $\ell_1$

$119: P_{24641} = (0, 1, 23, 1)$ lies on line $\ell_2$

$120: P_{24664} = (23, 1, 23, 1)$ lies on line $\ell_3$

$121: P_{25367} = (22, 23, 23, 1)$ lies on line $\ell_4$

$122: P_{25634} = (1, 0, 24, 1)$ lies on line $\ell_1$

$123: P_{25665} = (0, 1, 24, 1)$ lies on line $\ell_2$

$124: P_{25689} = (24, 1, 24, 1)$ lies on line $\ell_3$

$125: P_{26426} = (25, 24, 24, 1)$ lies on line $\ell_4$

$126: P_{26658} = (1, 0, 25, 1)$ lies on line $\ell_1$

$127: P_{26689} = (0, 1, 25, 1)$ lies on line $\ell_2$

$128: P_{26714} = (25, 1, 25, 1)$ lies on line $\ell_3$

$129: P_{27481} = (24, 25, 25, 1)$ lies on line $\ell_4$

$130: P_{27682} = (1, 0, 26, 1)$ lies on line $\ell_1$

$131: P_{27713} = (0, 1, 26, 1)$ lies on line $\ell_2$

$132: P_{27739} = (26, 1, 26, 1)$ lies on line $\ell_3$

$133: P_{28540} = (27, 26, 26, 1)$ lies on line $\ell_4$

$134: P_{28706} = (1, 0, 27, 1)$ lies on line $\ell_1$

$135: P_{28737} = (0, 1, 27, 1)$ lies on line $\ell_2$

$136: P_{28764} = (27, 1, 27, 1)$ lies on line $\ell_3$

$137: P_{29595} = (26, 27, 27, 1)$ lies on line $\ell_4$

$138: P_{29730} = (1, 0, 28, 1)$ lies on line $\ell_1$

$139: P_{29761} = (0, 1, 28, 1)$ lies on line $\ell_2$

$140: P_{29789} = (28, 1, 28, 1)$ lies on line $\ell_3$

$141: P_{30654} = (29, 28, 28, 1)$ lies on line $\ell_4$

$142: P_{30754} = (1, 0, 29, 1)$ lies on line $\ell_1$

$143: P_{30785} = (0, 1, 29, 1)$ lies on line $\ell_2$

144 : $P_{30814} = (29, 1, 29, 1)$ lies on line $\ell_3$
145 : $P_{31709} = (28, 29, 29, 1)$ lies on line $\ell_4$
146 : $P_{31778} = (1, 0, 30, 1)$ lies on line $\ell_1$
147 : $P_{31809} = (0, 1, 30, 1)$ lies on line $\ell_2$
148 : $P_{31839} = (30, 1, 30, 1)$ lies on line $\ell_3$
149 : $P_{32768} = (31, 30, 30, 1)$ lies on line $\ell_4$

150 : $P_{32802} = (1, 0, 31, 1)$ lies on line $\ell_1$
151 : $P_{32833} = (0, 1, 31, 1)$ lies on line $\ell_2$
152 : $P_{32864} = (31, 1, 31, 1)$ lies on line $\ell_3$
153 : $P_{33823} = (30, 31, 31, 1)$ lies on line $\ell_4$

The single points on the surface are:

## Points on surface but on no line

The surface has 930 points not on any line:
The points on the surface but not on lines are:

0 : $P_{103} = (4, 2, 1, 0)$
1 : $P_{136} = (5, 3, 1, 0)$
2 : $P_{179} = (16, 4, 1, 0)$
3 : $P_{212} = (17, 5, 1, 0)$
4 : $P_{247} = (20, 6, 1, 0)$
5 : $P_{280} = (21, 7, 1, 0)$
6 : $P_{301} = (10, 8, 1, 0)$
7 : $P_{334} = (11, 9, 1, 0)$
8 : $P_{369} = (14, 10, 1, 0)$
9 : $P_{402} = (15, 11, 1, 0)$
10 : $P_{445} = (26, 12, 1, 0)$
11 : $P_{478} = (27, 13, 1, 0)$
12 : $P_{513} = (30, 14, 1, 0)$
13 : $P_{546} = (31, 15, 1, 0)$
14 : $P_{560} = (13, 16, 1, 0)$
15 : $P_{591} = (12, 17, 1, 0)$
16 : $P_{620} = (9, 18, 1, 0)$
17 : $P_{651} = (8, 19, 1, 0)$
18 : $P_{704} = (29, 20, 1, 0)$
19 : $P_{735} = (28, 21, 1, 0)$
20 : $P_{764} = (25, 22, 1, 0)$
21 : $P_{795} = (24, 23, 1, 0)$
22 : $P_{810} = (7, 24, 1, 0)$
23 : $P_{841} = (6, 25, 1, 0)$
24 : $P_{870} = (3, 26, 1, 0)$
25 : $P_{901} = (2, 27, 1, 0)$
26 : $P_{954} = (23, 28, 1, 0)$
27 : $P_{985} = (22, 29, 1, 0)$
28 : $P_{1014} = (19, 30, 1, 0)$
29 : $P_{1045} = (18, 31, 1, 0)$
30 : $P_{1140} = (18, 2, 0, 1)$
31 : $P_{1164} = (10, 3, 0, 1)$
32 : $P_{1195} = (9, 4, 0, 1)$
33 : $P_{1232} = (14, 5, 0, 1)$
34 : $P_{1279} = (29, 6, 0, 1)$
35 : $P_{1285} = (3, 7, 0, 1)$
36 : $P_{1327} = (13, 8, 0, 1)$
37 : $P_{1369} = (23, 9, 0, 1)$

38 : $P_{1405} = (27, 10, 0, 1)$
39 : $P_{1434} = (24, 11, 0, 1)$
40 : $P_{1461} = (19, 12, 0, 1)$
41 : $P_{1489} = (15, 13, 0, 1)$
42 : $P_{1508} = (2, 14, 0, 1)$
43 : $P_{1545} = (7, 15, 0, 1)$
44 : $P_{1581} = (11, 16, 0, 1)$
45 : $P_{1632} = (30, 17, 0, 1)$
46 : $P_{1662} = (28, 18, 0, 1)$
47 : $P_{1682} = (16, 19, 0, 1)$
48 : $P_{1720} = (22, 20, 0, 1)$
49 : $P_{1735} = (5, 21, 0, 1)$
50 : $P_{1768} = (6, 22, 0, 1)$
51 : $P_{1806} = (12, 23, 0, 1)$
52 : $P_{1852} = (26, 24, 0, 1)$
53 : $P_{1878} = (20, 25, 0, 1)$
54 : $P_{1898} = (8, 26, 0, 1)$
55 : $P_{1953} = (31, 27, 0, 1)$
56 : $P_{1971} = (17, 28, 0, 1)$
57 : $P_{2011} = (25, 29, 0, 1)$
58 : $P_{2022} = (4, 30, 0, 1)$
59 : $P_{2071} = (21, 31, 0, 1)$
60 : $P_{2174} = (29, 2, 1, 1)$
61 : $P_{2176} = (31, 2, 1, 1)$
62 : $P_{2189} = (12, 3, 1, 1)$
63 : $P_{2192} = (15, 3, 1, 1)$
64 : $P_{2227} = (18, 4, 1, 1)$
65 : $P_{2231} = (22, 4, 1, 1)$
66 : $P_{2267} = (26, 5, 1, 1)$
67 : $P_{2272} = (31, 5, 1, 1)$
68 : $P_{2329} = (24, 7, 1, 1)$
69 : $P_{2336} = (31, 7, 1, 1)$
70 : $P_{2389} = (20, 9, 1, 1)$
71 : $P_{2398} = (29, 9, 1, 1)$
72 : $P_{2455} = (22, 11, 1, 1)$
73 : $P_{2462} = (29, 11, 1, 1)$
74 : $P_{2470} = (5, 12, 1, 1)$
75 : $P_{2474} = (9, 12, 1, 1)$

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$76: P_{2503} = (6, 13, 1, 1)$
$77: P_{2508} = (11, 13, 1, 1)$
$78: P_{2583} = (22, 15, 1, 1)$
$79: P_{2586} = (25, 15, 1, 1)$
$80: P_{2602} = (9, 16, 1, 1)$
$81: P_{2618} = (25, 16, 1, 1)$
$82: P_{2628} = (3, 17, 1, 1)$
$83: P_{2643} = (18, 17, 1, 1)$
$84: P_{2663} = (6, 18, 1, 1)$
$85: P_{2677} = (20, 18, 1, 1)$
$86: P_{2760} = (7, 21, 1, 1)$
$87: P_{2771} = (18, 21, 1, 1)$
$88: P_{2828} = (11, 23, 1, 1)$
$89: P_{2845} = (28, 23, 1, 1)$
$90: P_{2864} = (15, 24, 1, 1)$
$91: P_{2872} = (23, 24, 1, 1)$
$92: P_{2924} = (11, 26, 1, 1)$
$93: P_{2930} = (17, 26, 1, 1)$
$94: P_{2960} = (15, 27, 1, 1)$
$95: P_{2965} = (20, 27, 1, 1)$
$96: P_{2986} = (9, 28, 1, 1)$
$97: P_{2998} = (21, 28, 1, 1)$
$98: P_{3079} = (6, 31, 1, 1)$
$99: P_{3098} = (25, 31, 1, 1)$
$100: P_{3176} = (7, 2, 2, 1)$
$101: P_{3317} = (20, 6, 2, 1)$
$102: P_{3321} = (24, 6, 2, 1)$
$103: P_{3367} = (6, 8, 2, 1)$
$104: P_{3383} = (22, 8, 2, 1)$
$105: P_{3404} = (11, 9, 2, 1)$
$106: P_{3418} = (25, 9, 2, 1)$
$107: P_{3492} = (3, 12, 2, 1)$
$108: P_{3516} = (27, 12, 2, 1)$
$109: P_{3530} = (9, 13, 2, 1)$
$110: P_{3540} = (19, 13, 2, 1)$
$111: P_{3556} = (3, 14, 2, 1)$
$112: P_{3584} = (31, 14, 2, 1)$
$113: P_{3970} = (1, 27, 2, 1)$
$114: P_{3987} = (18, 27, 2, 1)$
$115: P_{4008} = (7, 28, 2, 1)$
$116: P_{4027} = (26, 28, 2, 1)$
$117: P_{4072} = (7, 30, 2, 1)$
$118: P_{4095} = (30, 30, 2, 1)$
$119: P_{4232} = (7, 3, 3, 1)$
$120: P_{4326} = (5, 6, 3, 1)$
$121: P_{4336} = (15, 6, 3, 1)$
$122: P_{4452} = (3, 10, 3, 1)$
$123: P_{4478} = (29, 10, 3, 1)$
$124: P_{4484} = (3, 11, 3, 1)$
$125: P_{4511} = (30, 11, 3, 1)$
$126: P_{4552} = (7, 13, 3, 1)$
$127: P_{4561} = (16, 13, 3, 1)$
$128: P_{4584} = (7, 14, 3, 1)$
$129: P_{4598} = (21, 14, 3, 1)$

$130: P_{4619} = (10, 15, 3, 1)$
$131: P_{4636} = (27, 15, 3, 1)$
$132: P_{4688} = (15, 17, 3, 1)$
$133: P_{4698} = (25, 17, 3, 1)$
$134: P_{4719} = (14, 18, 3, 1)$
$135: P_{4734} = (29, 18, 3, 1)$
$136: P_{4811} = (10, 21, 3, 1)$
$137: P_{4817} = (16, 21, 3, 1)$
$138: P_{4846} = (13, 22, 3, 1)$
$139: P_{4851} = (18, 22, 3, 1)$
$140: P_{4880} = (15, 23, 3, 1)$
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$548: P_{20121} = (24, 19, 18, 1)$
$549: P_{20163} = (2, 21, 18, 1)$
$550: P_{20187} = (26, 21, 18, 1)$
$551: P_{20212} = (19, 22, 18, 1)$
$552: P_{20217} = (24, 22, 18, 1)$
$553: P_{20291} = (2, 25, 18, 1)$
$554: P_{20317} = (28, 25, 18, 1)$
$555: P_{20408} = (23, 28, 18, 1)$
$556: P_{20410} = (25, 28, 18, 1)$
$557: P_{20482} = (1, 31, 18, 1)$
$558: P_{20509} = (28, 31, 18, 1)$
$559: P_{20620} = (11, 3, 19, 1)$
$560: P_{20636} = (27, 3, 19, 1)$
$561: P_{20790} = (21, 8, 19, 1)$

$562: P_{20794} = (25, 8, 19, 1)$
$563: P_{20879} = (14, 11, 19, 1)$
$564: P_{20883} = (18, 11, 19, 1)$
$565: P_{20942} = (13, 13, 19, 1)$
$566: P_{20949} = (20, 13, 19, 1)$
$567: P_{20995} = (2, 15, 19, 1)$
$568: P_{21017} = (24, 15, 19, 1)$
$569: P_{21062} = (5, 17, 19, 1)$
$570: P_{21071} = (14, 17, 19, 1)$
$571: P_{21091} = (2, 18, 19, 1)$
$572: P_{21114} = (25, 18, 19, 1)$
$573: P_{21147} = (26, 19, 19, 1)$
$574: P_{21166} = (13, 20, 19, 1)$
$575: P_{21172} = (19, 20, 19, 1)$
$576: P_{21204} = (19, 21, 19, 1)$
$577: P_{21215} = (30, 21, 19, 1)$
$578: P_{21256} = (7, 23, 19, 1)$
$579: P_{21258} = (9, 23, 19, 1)$
$580: P_{21287} = (6, 24, 19, 1)$
$581: P_{21299} = (18, 24, 19, 1)$
$582: P_{21323} = (10, 25, 19, 1)$
$583: P_{21326} = (13, 25, 19, 1)$
$584: P_{21359} = (14, 26, 19, 1)$
$585: P_{21370} = (25, 26, 19, 1)$
$586: P_{21443} = (2, 29, 19, 1)$
$587: P_{21444} = (3, 29, 19, 1)$
$588: P_{21474} = (1, 30, 19, 1)$
$589: P_{21489} = (16, 30, 19, 1)$
$590: P_{21730} = (1, 6, 20, 1)$
$591: P_{21751} = (22, 6, 20, 1)$
$592: P_{21808} = (15, 8, 20, 1)$
$593: P_{21823} = (30, 8, 20, 1)$
$594: P_{21955} = (2, 13, 20, 1)$
$595: P_{21982} = (29, 13, 20, 1)$
$596: P_{22075} = (26, 16, 20, 1)$
$597: P_{22078} = (29, 16, 20, 1)$
$598: P_{22092} = (11, 17, 20, 1)$
$599: P_{22105} = (24, 17, 20, 1)$
$600: P_{22130} = (17, 18, 20, 1)$
$601: P_{22140} = (27, 18, 20, 1)$
$602: P_{22185} = (8, 20, 20, 1)$
$603: P_{22213} = (4, 21, 20, 1)$
$604: P_{22222} = (13, 21, 20, 1)$
$605: P_{22256} = (15, 22, 20, 1)$
$606: P_{22272} = (31, 22, 20, 1)$
$607: P_{22420} = (19, 27, 20, 1)$
$608: P_{22429} = (28, 27, 20, 1)$
$609: P_{22470} = (5, 29, 20, 1)$
$610: P_{22494} = (29, 29, 20, 1)$
$611: P_{22511} = (14, 30, 20, 1)$
$612: P_{22512} = (15, 30, 20, 1)$
$613: P_{22629} = (4, 2, 21, 1)$
$614: P_{22636} = (11, 2, 21, 1)$
$615: P_{22660} = (3, 3, 21, 1)$

$616: P_{22682} = (25, 3, 21, 1)$

$617: P_{22739} = (18, 5, 21, 1)$

$618: P_{22746} = (25, 5, 21, 1)$

$619: P_{22761} = (8, 6, 21, 1)$

$620: P_{22778} = (25, 6, 21, 1)$

$621: P_{22786} = (1, 7, 21, 1)$

$622: P_{22790} = (5, 7, 21, 1)$

$623: P_{22821} = (4, 8, 21, 1)$

$624: P_{22846} = (29, 8, 21, 1)$

$625: P_{22885} = (4, 10, 21, 1)$

$626: P_{22899} = (18, 10, 21, 1)$

$627: P_{23028} = (19, 14, 21, 1)$

$628: P_{23036} = (27, 14, 21, 1)$

$629: P_{23056} = (15, 15, 21, 1)$

$630: P_{23059} = (18, 15, 21, 1)$

$631: P_{23075} = (2, 16, 21, 1)$

$632: P_{23094} = (21, 16, 21, 1)$

$633: P_{23126} = (21, 17, 21, 1)$

$634: P_{23128} = (23, 17, 21, 1)$

$635: P_{23144} = (7, 18, 21, 1)$

$636: P_{23168} = (31, 18, 21, 1)$

$637: P_{23174} = (5, 19, 21, 1)$

$638: P_{23177} = (8, 19, 21, 1)$

$639: P_{23206} = (5, 20, 21, 1)$

$640: P_{23213} = (12, 20, 21, 1)$

$641: P_{23241} = (8, 21, 21, 1)$

$642: P_{23351} = (22, 24, 21, 1)$

$643: P_{23353} = (24, 24, 21, 1)$

$644: P_{23435} = (10, 27, 21, 1)$

$645: P_{23455} = (30, 27, 21, 1)$

$646: P_{23569} = (16, 31, 21, 1)$

$647: P_{23579} = (26, 31, 21, 1)$

$648: P_{23665} = (16, 2, 22, 1)$

$649: P_{23674} = (25, 2, 22, 1)$

$650: P_{23723} = (10, 4, 22, 1)$

$651: P_{23737} = (24, 4, 22, 1)$

$652: P_{23786} = (9, 6, 22, 1)$

$653: P_{23795} = (18, 6, 22, 1)$

$654: P_{23859} = (18, 8, 22, 1)$

$655: P_{23860} = (19, 8, 22, 1)$

$656: P_{23941} = (4, 11, 22, 1)$

$657: P_{23963} = (26, 11, 22, 1)$

$658: P_{24041} = (8, 14, 22, 1)$

$659: P_{24051} = (18, 14, 22, 1)$

$660: P_{24303} = (14, 22, 22, 1)$

$661: P_{24323} = (2, 23, 22, 1)$

$662: P_{24334} = (13, 23, 22, 1)$

$663: P_{24397} = (12, 25, 22, 1)$

$664: P_{24410} = (25, 25, 22, 1)$

$665: P_{24438} = (21, 26, 22, 1)$

$666: P_{24448} = (31, 26, 22, 1)$

$667: P_{24454} = (5, 27, 22, 1)$

$668: P_{24474} = (25, 27, 22, 1)$

$669: P_{24514} = (1, 29, 22, 1)$

$670: P_{24519} = (6, 29, 22, 1)$

$671: P_{24745} = (8, 4, 23, 1)$

$672: P_{24767} = (30, 4, 23, 1)$

$673: P_{24902} = (5, 9, 23, 1)$

$674: P_{24924} = (27, 9, 23, 1)$

$675: P_{24941} = (12, 10, 23, 1)$

$676: P_{24943} = (14, 10, 23, 1)$

$677: P_{24970} = (9, 11, 23, 1)$

$678: P_{24989} = (28, 11, 23, 1)$

$679: P_{25004} = (11, 12, 23, 1)$

$680: P_{25013} = (20, 12, 23, 1)$

$681: P_{25070} = (13, 14, 23, 1)$

$682: P_{25082} = (25, 14, 23, 1)$

$683: P_{25134} = (13, 16, 23, 1)$

$684: P_{25152} = (31, 16, 23, 1)$

$685: P_{25170} = (17, 17, 23, 1)$

$686: P_{25173} = (20, 17, 23, 1)$

$687: P_{25196} = (11, 18, 23, 1)$

$688: P_{25203} = (18, 18, 23, 1)$

$689: P_{25221} = (4, 19, 23, 1)$

$690: P_{25227} = (10, 19, 23, 1)$

$691: P_{25287} = (6, 21, 23, 1)$

$692: P_{25302} = (21, 21, 23, 1)$

$693: P_{25316} = (3, 22, 23, 1)$

$694: P_{25325} = (12, 22, 23, 1)$

$695: P_{25359} = (14, 23, 23, 1)$

$696: P_{25448} = (7, 26, 23, 1)$

$697: P_{25464} = (23, 26, 23, 1)$

$698: P_{25489} = (16, 27, 23, 1)$

$699: P_{25496} = (23, 27, 23, 1)$

$700: P_{25506} = (1, 28, 23, 1)$

$701: P_{25517} = (12, 28, 23, 1)$

$702: P_{25551} = (14, 29, 23, 1)$

$703: P_{25557} = (20, 29, 23, 1)$

$704: P_{25580} = (11, 30, 23, 1)$

$705: P_{25582} = (13, 30, 23, 1)$

$706: P_{25710} = (13, 2, 24, 1)$

$707: P_{25721} = (24, 2, 24, 1)$

$708: P_{25750} = (21, 3, 24, 1)$

$709: P_{25753} = (24, 3, 24, 1)$

$710: P_{25903} = (14, 8, 24, 1)$

$711: P_{25905} = (16, 8, 24, 1)$

$712: P_{25930} = (9, 9, 24, 1)$

$713: P_{25936} = (15, 9, 24, 1)$

$714: P_{25987} = (2, 11, 24, 1)$

$715: P_{26002} = (17, 11, 24, 1)$

$716: P_{26029} = (12, 12, 24, 1)$

$717: P_{26046} = (29, 12, 24, 1)$

$718: P_{26067} = (18, 13, 24, 1)$

$719: P_{26076} = (27, 13, 24, 1)$

$720: P_{26107} = (26, 14, 24, 1)$

$721: P_{26111} = (30, 14, 24, 1)$

$722: P_{26124} = (11, 15, 24, 1)$

$723: P_{26136} = (23, 15, 24, 1)$

$724: P_{26155} = (10, 16, 24, 1)$
$725: P_{26164} = (19, 16, 24, 1)$
$726: P_{26256} = (15, 19, 24, 1)$
$727: P_{26268} = (27, 19, 24, 1)$
$728: P_{26366} = (29, 22, 24, 1)$
$729: P_{26367} = (30, 22, 24, 1)$
$730: P_{26370} = (1, 23, 24, 1)$
$731: P_{26395} = (26, 23, 24, 1)$
$732: P_{26431} = (30, 24, 24, 1)$
$733: P_{26438} = (5, 25, 24, 1)$
$734: P_{26459} = (26, 25, 24, 1)$
$735: P_{26480} = (15, 26, 24, 1)$
$736: P_{26494} = (29, 26, 24, 1)$
$737: P_{26549} = (20, 28, 24, 1)$
$738: P_{26557} = (28, 28, 24, 1)$
$739: P_{26599} = (6, 30, 24, 1)$
$740: P_{26620} = (27, 30, 24, 1)$
$741: P_{26727} = (6, 2, 25, 1)$
$742: P_{26738} = (17, 2, 25, 1)$
$743: P_{26771} = (18, 3, 25, 1)$
$744: P_{26781} = (28, 3, 25, 1)$
$745: P_{26791} = (6, 4, 25, 1)$
$746: P_{26798} = (13, 4, 25, 1)$
$747: P_{26855} = (6, 6, 25, 1)$
$748: P_{26875} = (26, 6, 25, 1)$
$749: P_{26985} = (8, 10, 25, 1)$
$750: P_{26986} = (9, 10, 25, 1)$
$751: P_{27140} = (3, 15, 25, 1)$
$752: P_{27153} = (16, 15, 25, 1)$
$753: P_{27176} = (7, 16, 25, 1)$
$754: P_{27183} = (14, 16, 25, 1)$
$755: P_{27306} = (9, 20, 25, 1)$
$756: P_{27308} = (11, 20, 25, 1)$
$757: P_{27362} = (1, 22, 25, 1)$
$758: P_{27381} = (20, 22, 25, 1)$
$759: P_{27429} = (4, 24, 25, 1)$
$760: P_{27452} = (27, 24, 25, 1)$
$761: P_{27487} = (30, 25, 25, 1)$
$762: P_{27626} = (9, 30, 25, 1)$
$763: P_{27627} = (10, 30, 25, 1)$
$764: P_{27852} = (11, 5, 26, 1)$
$765: P_{27863} = (22, 5, 26, 1)$
$766: P_{27909} = (4, 7, 26, 1)$
$767: P_{27913} = (8, 7, 26, 1)$
$768: P_{27957} = (20, 8, 26, 1)$
$769: P_{27963} = (26, 8, 26, 1)$
$770: P_{27983} = (14, 9, 26, 1)$
$771: P_{27995} = (26, 9, 26, 1)$
$772: P_{28008} = (7, 10, 26, 1)$
$773: P_{28025} = (24, 10, 26, 1)$
$774: P_{28041} = (8, 11, 26, 1)$
$775: P_{28046} = (13, 11, 26, 1)$
$776: P_{28066} = (1, 12, 26, 1)$
$777: P_{28073} = (8, 12, 26, 1)$

$778: P_{28197} = (4, 16, 26, 1)$
$779: P_{28217} = (24, 16, 26, 1)$
$780: P_{28421} = (4, 23, 26, 1)$
$781: P_{28437} = (20, 23, 26, 1)$
$782: P_{28484} = (3, 25, 26, 1)$
$783: P_{28492} = (11, 25, 26, 1)$
$784: P_{28537} = (24, 26, 26, 1)$
$785: P_{28588} = (11, 28, 26, 1)$
$786: P_{28607} = (30, 28, 26, 1)$
$787: P_{28625} = (16, 29, 26, 1)$
$788: P_{28640} = (31, 29, 26, 1)$
$789: P_{28683} = (10, 31, 26, 1)$
$790: P_{28693} = (20, 31, 26, 1)$
$791: P_{29040} = (15, 10, 27, 1)$
$792: P_{29051} = (26, 10, 27, 1)$
$793: P_{29122} = (1, 13, 27, 1)$
$794: P_{29152} = (31, 13, 27, 1)$
$795: P_{29167} = (14, 14, 27, 1)$
$796: P_{29177} = (24, 14, 27, 1)$
$797: P_{29235} = (18, 16, 27, 1)$
$798: P_{29247} = (30, 16, 27, 1)$
$799: P_{29262} = (13, 17, 27, 1)$
$800: P_{29275} = (26, 17, 27, 1)$
$801: P_{29290} = (9, 18, 27, 1)$
$802: P_{29303} = (22, 18, 27, 1)$
$803: P_{29338} = (25, 19, 27, 1)$
$804: P_{29342} = (29, 19, 27, 1)$
$805: P_{29389} = (12, 21, 27, 1)$
$806: P_{29401} = (24, 21, 27, 1)$
$807: P_{29511} = (6, 25, 27, 1)$
$808: P_{29528} = (23, 25, 27, 1)$
$809: P_{29593} = (24, 27, 27, 1)$
$810: P_{29807} = (14, 2, 28, 1)$
$811: P_{29812} = (19, 2, 28, 1)$
$812: P_{29872} = (15, 4, 28, 1)$
$813: P_{29873} = (16, 4, 28, 1)$
$814: P_{29894} = (5, 5, 28, 1)$
$815: P_{29895} = (6, 5, 28, 1)$
$816: P_{29960} = (7, 7, 28, 1)$
$817: P_{29978} = (25, 7, 28, 1)$
$818: P_{29995} = (10, 8, 28, 1)$
$819: P_{30002} = (17, 8, 28, 1)$
$820: P_{30035} = (18, 9, 28, 1)$
$821: P_{30038} = (21, 9, 28, 1)$
$822: P_{30065} = (16, 10, 28, 1)$
$823: P_{30071} = (22, 10, 28, 1)$
$824: P_{30137} = (24, 12, 28, 1)$
$825: P_{30141} = (28, 12, 28, 1)$
$826: P_{30149} = (4, 13, 28, 1)$
$827: P_{30173} = (28, 13, 28, 1)$
$828: P_{30186} = (9, 14, 28, 1)$
$829: P_{30193} = (16, 14, 28, 1)$
$830: P_{30279} = (6, 17, 28, 1)$
$831: P_{30282} = (9, 17, 28, 1)$

$832 : P_{30308} = (3, 18, 28, 1)$
$833 : P_{30318} = (13, 18, 28, 1)$
$834 : P_{30375} = (6, 20, 28, 1)$
$835 : P_{30379} = (10, 20, 28, 1)$
$836 : P_{30402} = (1, 21, 28, 1)$
$837 : P_{30418} = (17, 21, 28, 1)$
$838 : P_{30635} = (10, 28, 28, 1)$
$839 : P_{30674} = (17, 29, 28, 1)$
$840 : P_{30683} = (26, 29, 28, 1)$
$841 : P_{30691} = (2, 30, 28, 1)$
$842 : P_{30697} = (8, 30, 28, 1)$
$843 : P_{30730} = (9, 31, 28, 1)$
$844 : P_{30752} = (31, 31, 28, 1)$
$845 : P_{30825} = (8, 2, 29, 1)$
$846 : P_{30840} = (23, 2, 29, 1)$
$847 : P_{31043} = (2, 9, 29, 1)$
$848 : P_{31053} = (12, 9, 29, 1)$
$849 : P_{31092} = (19, 10, 29, 1)$
$850 : P_{31104} = (31, 10, 29, 1)$
$851 : P_{31144} = (7, 12, 29, 1)$
$852 : P_{31152} = (15, 12, 29, 1)$
$853 : P_{31172} = (3, 13, 29, 1)$
$854 : P_{31191} = (22, 13, 29, 1)$
$855 : P_{31391} = (30, 19, 29, 1)$
$856 : P_{31392} = (31, 19, 29, 1)$
$857 : P_{31394} = (1, 20, 29, 1)$
$858 : P_{31418} = (25, 20, 29, 1)$
$859 : P_{31474} = (17, 22, 29, 1)$
$860 : P_{31479} = (22, 22, 29, 1)$
$861 : P_{31571} = (18, 25, 29, 1)$
$862 : P_{31584} = (31, 25, 29, 1)$
$863 : P_{31621} = (4, 27, 29, 1)$
$864 : P_{31639} = (22, 27, 29, 1)$
$865 : P_{31665} = (16, 28, 29, 1)$
$866 : P_{31676} = (27, 28, 29, 1)$
$867 : P_{31691} = (10, 29, 29, 1)$
$868 : P_{31940} = (3, 5, 30, 1)$
$869 : P_{31947} = (10, 5, 30, 1)$
$870 : P_{31985} = (16, 6, 30, 1)$
$871 : P_{31999} = (30, 6, 30, 1)$
$872 : P_{32015} = (14, 7, 30, 1)$
$873 : P_{32031} = (30, 7, 30, 1)$
$874 : P_{32075} = (10, 9, 30, 1)$
$875 : P_{32096} = (31, 9, 30, 1)$
$876 : P_{32152} = (23, 11, 30, 1)$
$877 : P_{32156} = (27, 11, 30, 1)$
$878 : P_{32171} = (10, 12, 30, 1)$
$879 : P_{32183} = (22, 12, 30, 1)$
$880 : P_{32226} = (1, 14, 30, 1)$
$881 : P_{32229} = (4, 14, 30, 1)$

$882 : P_{32295} = (6, 16, 30, 1)$
$883 : P_{32305} = (16, 16, 30, 1)$
$884 : P_{32392} = (7, 19, 30, 1)$
$885 : P_{32407} = (22, 19, 30, 1)$
$886 : P_{32443} = (26, 20, 30, 1)$
$887 : P_{32444} = (27, 20, 30, 1)$
$888 : P_{32489} = (8, 22, 30, 1)$
$889 : P_{32497} = (16, 22, 30, 1)$
$890 : P_{32538} = (25, 23, 30, 1)$
$891 : P_{32544} = (31, 23, 30, 1)$
$892 : P_{32618} = (9, 26, 30, 1)$
$893 : P_{32622} = (13, 26, 30, 1)$
$894 : P_{32691} = (18, 28, 30, 1)$
$895 : P_{32697} = (24, 28, 30, 1)$
$896 : P_{32749} = (12, 30, 30, 1)$
$897 : P_{32791} = (22, 31, 30, 1)$
$898 : P_{32796} = (27, 31, 30, 1)$
$899 : P_{32870} = (5, 2, 31, 1)$
$900 : P_{32895} = (30, 2, 31, 1)$
$901 : P_{32916} = (19, 3, 31, 1)$
$902 : P_{32920} = (23, 3, 31, 1)$
$903 : P_{32978} = (17, 5, 31, 1)$
$904 : P_{32990} = (29, 5, 31, 1)$
$905 : P_{33037} = (12, 7, 31, 1)$
$906 : P_{33052} = (27, 7, 31, 1)$
$907 : P_{33282} = (1, 15, 31, 1)$
$908 : P_{33302} = (21, 15, 31, 1)$
$909 : P_{33316} = (3, 16, 31, 1)$
$910 : P_{33318} = (5, 16, 31, 1)$
$911 : P_{33347} = (2, 17, 31, 1)$
$912 : P_{33372} = (27, 17, 31, 1)$
$913 : P_{33382} = (5, 18, 31, 1)$
$914 : P_{33401} = (24, 18, 31, 1)$
$915 : P_{33495} = (22, 21, 31, 1)$
$916 : P_{33501} = (28, 21, 31, 1)$
$917 : P_{33526} = (21, 22, 31, 1)$
$918 : P_{33532} = (27, 22, 31, 1)$
$919 : P_{33578} = (9, 24, 31, 1)$
$920 : P_{33581} = (12, 24, 31, 1)$
$921 : P_{33616} = (15, 25, 31, 1)$
$922 : P_{33622} = (21, 25, 31, 1)$
$923 : P_{33671} = (6, 27, 31, 1)$
$924 : P_{33672} = (7, 27, 31, 1)$
$925 : P_{33752} = (23, 29, 31, 1)$
$926 : P_{33759} = (30, 29, 31, 1)$
$927 : P_{33784} = (23, 30, 31, 1)$
$928 : P_{33787} = (26, 30, 31, 1)$
$929 : P_{33805} = (12, 31, 31, 1)$

# Line Intersection Graph

```
  0 1 2 3 4
0 0 1 1 1 0
1 1 0 1 0 1
2 1 1 0 1 1
3 1 0 1 0 0
4 0 1 1 0 0
```

Neighbor sets in the line intersection graph:

Line 0 intersects

| Line | $\ell_1$ | $\ell_2$ | $\ell_3$ |
|------|----------|----------|----------|
| in point | $P_2$ | $P_2$ | $P_{36}$ |

Line 1 intersects

| Line | $\ell_0$ | $\ell_2$ | $\ell_4$ |
|------|----------|----------|----------|
| in point | $P_2$ | $P_2$ | $P_{1059}$ |

Line 2 intersects

| Line | $\ell_0$ | $\ell_1$ | $\ell_3$ | $\ell_4$ |
|------|----------|----------|----------|----------|
| in point | $P_2$ | $P_2$ | $P_{1090}$ | $P_{2114}$ |

Line 3 intersects

| Line | $\ell_0$ | $\ell_2$ |
|------|----------|----------|
| in point | $P_{36}$ | $P_{1090}$ |

Line 4 intersects

| Line | $\ell_1$ | $\ell_2$ |
|------|----------|----------|
| in point | $P_{1059}$ | $P_{2114}$ |

The surface has 1089 points:
Too many to print.