Rank-31 over GF(32)

January 15, 2021

The equation

The equation of the surface is :

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

(1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0)
The point rank of the equation over GF(32) is 2131

General information

Number of lines	3
Number of points	1057
Number of singular points	0
Number of Eckardt points	1
Number of double points	0
Number of single points	96
Number of points off lines	960
Number of Hesse planes	0
Number of axes	0
Type of points on lines	33^3
Type of lines on points	3, 1^{96}, 0^{960}

Singular Points

The surface has 0 singular points:

The 3 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{2082} = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{2082} = \mathbf{Pl}(0,0,1,1,1,1)_{70562}$$

$$\ell_1 = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}_{1089} = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}_{1089} = \mathbf{Pl}(1,1,0,0,1,1)_{68609}$$

$$\ell_2 = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}_{33825} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}_{33825} = \mathbf{Pl}(1,1,1,1,0,0)_{128}$$

Rank of lines: (2082, 1089, 33825)
Rank of points on Klein quadric: (70562, 68609, 128)

Eckardt Points

The surface has 1 Eckardt points:
$0 : P_4 = \mathbf{P}(1,1,1,1) = \mathbf{P}(1,1,1,1)$.

Double Points

The surface has 0 Double points:
The double points on the surface are:

Single Points

The surface has 96 single points:
The single points on the surface are:

$0 : P_5 = (1,1,0,0)$ lies on line ℓ_0
$1 : P_{36} = (1,0,1,0)$ lies on line ℓ_1
$2 : P_{67} = (0,1,1,0)$ lies on line ℓ_2
$3 : P_{1059} = (1,0,0,1)$ lies on line ℓ_2
$4 : P_{1090} = (0,1,0,1)$ lies on line ℓ_1
$5 : P_{2082} = (0,0,1,1)$ lies on line ℓ_0
$6 : P_{2147} = (2,2,1,1)$ lies on line ℓ_0
$7 : P_{2180} = (3,3,1,1)$ lies on line ℓ_0
$8 : P_{2213} = (4,4,1,1)$ lies on line ℓ_0
$9 : P_{2246} = (5,5,1,1)$ lies on line ℓ_0
$10 : P_{2279} = (6,6,1,1)$ lies on line ℓ_0
$11 : P_{2312} = (7,7,1,1)$ lies on line ℓ_0
$12 : P_{2345} = (8,8,1,1)$ lies on line ℓ_0
$13 : P_{2378} = (9,9,1,1)$ lies on line ℓ_0
$14 : P_{2411} = (10,10,1,1)$ lies on line ℓ_0
$15 : P_{2444} = (11,11,1,1)$ lies on line ℓ_0
$16 : P_{2477} = (12,12,1,1)$ lies on line ℓ_0
$17 : P_{2510} = (13,13,1,1)$ lies on line ℓ_0
$18 : P_{2543} = (14,14,1,1)$ lies on line ℓ_0
$19 : P_{2576} = (15,15,1,1)$ lies on line ℓ_0
$20 : P_{2609} = (16,16,1,1)$ lies on line ℓ_0
$21 : P_{2642} = (17,17,1,1)$ lies on line ℓ_0
$22 : P_{2675} = (18,18,1,1)$ lies on line ℓ_0
$23 : P_{2708} = (19,19,1,1)$ lies on line ℓ_0
$24 : P_{2741} = (20,20,1,1)$ lies on line ℓ_0
$25 : P_{2774} = (21,21,1,1)$ lies on line ℓ_0
$26 : P_{2807} = (22,22,1,1)$ lies on line ℓ_0
$27 : P_{2840} = (23,23,1,1)$ lies on line ℓ_0
$28 : P_{2873} = (24,24,1,1)$ lies on line ℓ_0
$29 : P_{2906} = (25,25,1,1)$ lies on line ℓ_0
$30 : P_{2939} = (26,26,1,1)$ lies on line ℓ_0
$31 : P_{2972} = (27,27,1,1)$ lies on line ℓ_0
$32 : P_{3005} = (28,28,1,1)$ lies on line ℓ_0
$33 : P_{3038} = (29,29,1,1)$ lies on line ℓ_0
$34 : P_{3071} = (30,30,1,1)$ lies on line ℓ_0
$35 : P_{3104} = (31,31,1,1)$ lies on line ℓ_0
$36 : P_{3139} = (2,1,2,1)$ lies on line ℓ_1
$37 : P_{3170} = (1,2,2,1)$ lies on line ℓ_2
$38 : P_{4164} = (3,1,3,1)$ lies on line ℓ_1
$39 : P_{4226} = (1,3,3,1)$ lies on line ℓ_2
$40 : P_{5189} = (4,1,4,1)$ lies on line ℓ_1
$41 : P_{5282} = (1,4,4,1)$ lies on line ℓ_2
$42 : P_{6214} = (5,1,5,1)$ lies on line ℓ_1
$43 : P_{6338} = (1,5,5,1)$ lies on line ℓ_2
$44 : P_{7239} = (6,1,6,1)$ lies on line ℓ_1
$45 : P_{7394} = (1,6,6,1)$ lies on line ℓ_2
$46 : P_{8264} = (7,1,7,1)$ lies on line ℓ_1
$47 : P_{8450} = (1,7,7,1)$ lies on line ℓ_2
$48 : P_{9289} = (8,1,8,1)$ lies on line ℓ_1
$49 : P_{9506} = (1,8,8,1)$ lies on line ℓ_2
$50 : P_{10314} = (9,1,9,1)$ lies on line ℓ_1
$51 : P_{10562} = (1,9,9,1)$ lies on line ℓ_2
$52 : P_{11339} = (10,1,10,1)$ lies on line ℓ_1
$53 : P_{11618} = (1,10,10,1)$ lies on line ℓ_2
$54 : P_{12364} = (11,1,11,1)$ lies on line ℓ_1
$55 : P_{12674} = (1,11,11,1)$ lies on line ℓ_2
$56 : P_{13389} = (12,1,12,1)$ lies on line ℓ_1
$57 : P_{13730} = (1,12,12,1)$ lies on line ℓ_2

58 : $P_{14414} = (13, 1, 13, 1)$ lies on line ℓ_1
59 : $P_{14786} = (1, 13, 13, 1)$ lies on line ℓ_2
60 : $P_{15439} = (14, 1, 14, 1)$ lies on line ℓ_1
61 : $P_{15842} = (1, 14, 14, 1)$ lies on line ℓ_2
62 : $P_{16464} = (15, 1, 15, 1)$ lies on line ℓ_1
63 : $P_{16898} = (1, 15, 15, 1)$ lies on line ℓ_2
64 : $P_{17489} = (16, 1, 16, 1)$ lies on line ℓ_1
65 : $P_{17954} = (1, 16, 16, 1)$ lies on line ℓ_2
66 : $P_{18514} = (17, 1, 17, 1)$ lies on line ℓ_1
67 : $P_{19010} = (1, 17, 17, 1)$ lies on line ℓ_2
68 : $P_{19539} = (18, 1, 18, 1)$ lies on line ℓ_1
69 : $P_{20066} = (1, 18, 18, 1)$ lies on line ℓ_2
70 : $P_{20564} = (19, 1, 19, 1)$ lies on line ℓ_1
71 : $P_{21122} = (1, 19, 19, 1)$ lies on line ℓ_2
72 : $P_{21589} = (20, 1, 20, 1)$ lies on line ℓ_1
73 : $P_{22178} = (1, 20, 20, 1)$ lies on line ℓ_2
74 : $P_{22614} = (21, 1, 21, 1)$ lies on line ℓ_1
75 : $P_{23234} = (1, 21, 21, 1)$ lies on line ℓ_2
76 : $P_{23639} = (22, 1, 22, 1)$ lies on line ℓ_1
77 : $P_{24290} = (1, 22, 22, 1)$ lies on line ℓ_2
78 : $P_{24664} = (23, 1, 23, 1)$ lies on line ℓ_1
79 : $P_{25346} = (1, 23, 23, 1)$ lies on line ℓ_2
80 : $P_{25689} = (24, 1, 24, 1)$ lies on line ℓ_1
81 : $P_{26402} = (1, 24, 24, 1)$ lies on line ℓ_2
82 : $P_{26714} = (25, 1, 25, 1)$ lies on line ℓ_1
83 : $P_{27458} = (1, 25, 25, 1)$ lies on line ℓ_2
84 : $P_{27739} = (26, 1, 26, 1)$ lies on line ℓ_1
85 : $P_{28514} = (1, 26, 26, 1)$ lies on line ℓ_2
86 : $P_{28764} = (27, 1, 27, 1)$ lies on line ℓ_1
87 : $P_{29570} = (1, 27, 27, 1)$ lies on line ℓ_2
88 : $P_{29789} = (28, 1, 28, 1)$ lies on line ℓ_1
89 : $P_{30626} = (1, 28, 28, 1)$ lies on line ℓ_2
90 : $P_{30814} = (29, 1, 29, 1)$ lies on line ℓ_1
91 : $P_{31682} = (1, 29, 29, 1)$ lies on line ℓ_2
92 : $P_{31839} = (30, 1, 30, 1)$ lies on line ℓ_1
93 : $P_{32738} = (1, 30, 30, 1)$ lies on line ℓ_2
94 : $P_{32864} = (31, 1, 31, 1)$ lies on line ℓ_1
95 : $P_{33794} = (1, 31, 31, 1)$ lies on line ℓ_2

The single points on the surface are:

Points on surface but on no line

The surface has 960 points not on any line:
The points on the surface but not on lines are:

0 : $P_{111} = (12, 2, 1, 0)$
1 : $P_{147} = (16, 3, 1, 0)$
2 : $P_{189} = (26, 4, 1, 0)$
3 : $P_{208} = (13, 5, 1, 0)$
4 : $P_{245} = (18, 6, 1, 0)$
5 : $P_{273} = (14, 7, 1, 0)$
6 : $P_{314} = (23, 8, 1, 0)$
7 : $P_{343} = (20, 9, 1, 0)$
8 : $P_{379} = (24, 10, 1, 0)$
9 : $P_{416} = (29, 11, 1, 0)$
10 : $P_{421} = (2, 12, 1, 0)$
11 : $P_{456} = (5, 13, 1, 0)$
12 : $P_{490} = (7, 14, 1, 0)$
13 : $P_{537} = (22, 15, 1, 0)$
14 : $P_{550} = (3, 16, 1, 0)$
15 : $P_{606} = (27, 17, 1, 0)$
16 : $P_{617} = (6, 18, 1, 0)$
17 : $P_{671} = (28, 19, 1, 0)$
18 : $P_{684} = (9, 20, 1, 0)$
19 : $P_{737} = (30, 21, 1, 0)$
20 : $P_{754} = (15, 22, 1, 0)$
21 : $P_{779} = (8, 23, 1, 0)$
22 : $P_{813} = (10, 24, 1, 0)$
23 : $P_{866} = (31, 25, 1, 0)$
24 : $P_{871} = (4, 26, 1, 0)$
25 : $P_{916} = (17, 27, 1, 0)$
26 : $P_{950} = (19, 28, 1, 0)$
27 : $P_{974} = (11, 29, 1, 0)$
28 : $P_{1016} = (21, 30, 1, 0)$
29 : $P_{1052} = (25, 31, 1, 0)$
30 : $P_{1134} = (12, 2, 0, 1)$
31 : $P_{1170} = (16, 3, 0, 1)$
32 : $P_{1212} = (26, 4, 0, 1)$
33 : $P_{1231} = (13, 5, 0, 1)$
34 : $P_{1268} = (18, 6, 0, 1)$
35 : $P_{1296} = (14, 7, 0, 1)$
36 : $P_{1337} = (23, 8, 0, 1)$
37 : $P_{1366} = (20, 9, 0, 1)$
38 : $P_{1402} = (24, 10, 0, 1)$
39 : $P_{1439} = (29, 11, 0, 1)$
40 : $P_{1444} = (2, 12, 0, 1)$
41 : $P_{1479} = (5, 13, 0, 1)$
42 : $P_{1513} = (7, 14, 0, 1)$
43 : $P_{1560} = (22, 15, 0, 1)$
44 : $P_{1573} = (3, 16, 0, 1)$
45 : $P_{1629} = (27, 17, 0, 1)$
46 : $P_{1640} = (6, 18, 0, 1)$
47 : $P_{1694} = (28, 19, 0, 1)$

$48: P_{1707} = (9, 20, 0, 1)$
$49: P_{1760} = (30, 21, 0, 1)$
$50: P_{1777} = (15, 22, 0, 1)$
$51: P_{1802} = (8, 23, 0, 1)$
$52: P_{1836} = (10, 24, 0, 1)$
$53: P_{1889} = (31, 25, 0, 1)$
$54: P_{1894} = (4, 26, 0, 1)$
$55: P_{1939} = (17, 27, 0, 1)$
$56: P_{1973} = (19, 28, 0, 1)$
$57: P_{1997} = (11, 29, 0, 1)$
$58: P_{2039} = (21, 30, 0, 1)$
$59: P_{2075} = (25, 31, 0, 1)$
$60: P_{3117} = (12, 0, 2, 1)$
$61: P_{3212} = (11, 3, 2, 1)$
$62: P_{3243} = (10, 4, 2, 1)$
$63: P_{3283} = (18, 5, 2, 1)$
$64: P_{3310} = (13, 6, 2, 1)$
$65: P_{3357} = (28, 7, 2, 1)$
$66: P_{3388} = (27, 8, 2, 1)$
$67: P_{3414} = (21, 9, 2, 1)$
$68: P_{3429} = (4, 10, 2, 1)$
$69: P_{3460} = (3, 11, 2, 1)$
$70: P_{3489} = (0, 12, 2, 1)$
$71: P_{3527} = (6, 13, 2, 1)$
$72: P_{3572} = (19, 14, 2, 1)$
$73: P_{3616} = (31, 15, 2, 1)$
$74: P_{3646} = (29, 16, 2, 1)$
$75: P_{3672} = (23, 17, 2, 1)$
$76: P_{3686} = (5, 18, 2, 1)$
$77: P_{3727} = (14, 19, 2, 1)$
$78: P_{3775} = (30, 20, 2, 1)$
$79: P_{3786} = (9, 21, 2, 1)$
$80: P_{3834} = (25, 22, 2, 1)$
$81: P_{3858} = (17, 23, 2, 1)$
$82: P_{3899} = (26, 24, 2, 1)$
$83: P_{3927} = (22, 25, 2, 1)$
$84: P_{3961} = (24, 26, 2, 1)$
$85: P_{3977} = (8, 27, 2, 1)$
$86: P_{4008} = (7, 28, 2, 1)$
$87: P_{4049} = (16, 29, 2, 1)$
$88: P_{4085} = (20, 30, 2, 1)$
$89: P_{4112} = (15, 31, 2, 1)$
$90: P_{4145} = (16, 0, 3, 1)$
$91: P_{4204} = (11, 2, 3, 1)$
$92: P_{4264} = (7, 4, 3, 1)$
$93: P_{4319} = (30, 5, 3, 1)$
$94: P_{4330} = (9, 6, 3, 1)$
$95: P_{4357} = (4, 7, 3, 1)$
$96: P_{4400} = (15, 8, 3, 1)$
$97: P_{4423} = (6, 9, 3, 1)$
$98: P_{4477} = (28, 10, 3, 1)$
$99: P_{4483} = (2, 11, 3, 1)$
$100: P_{4542} = (29, 12, 3, 1)$
$101: P_{4566} = (21, 13, 3, 1)$
$102: P_{4603} = (26, 14, 3, 1)$
$103: P_{4617} = (8, 15, 3, 1)$
$104: P_{4641} = (0, 16, 3, 1)$
$105: P_{4698} = (25, 17, 3, 1)$
$106: P_{4725} = (20, 18, 3, 1)$
$107: P_{4761} = (24, 19, 3, 1)$
$108: P_{4787} = (18, 20, 3, 1)$
$109: P_{4814} = (13, 21, 3, 1)$
$110: P_{4856} = (23, 22, 3, 1)$
$111: P_{4887} = (22, 23, 3, 1)$
$112: P_{4916} = (19, 24, 3, 1)$
$113: P_{4946} = (17, 25, 3, 1)$
$114: P_{4975} = (14, 26, 3, 1)$
$115: P_{5024} = (31, 27, 3, 1)$
$116: P_{5035} = (10, 28, 3, 1)$
$117: P_{5069} = (12, 29, 3, 1)$
$118: P_{5094} = (5, 30, 3, 1)$
$119: P_{5148} = (27, 31, 3, 1)$
$120: P_{5179} = (26, 0, 4, 1)$
$121: P_{5227} = (10, 2, 4, 1)$
$122: P_{5256} = (7, 3, 4, 1)$
$123: P_{5328} = (15, 5, 4, 1)$
$124: P_{5370} = (25, 6, 4, 1)$
$125: P_{5380} = (3, 7, 4, 1)$
$126: P_{5439} = (30, 8, 4, 1)$
$127: P_{5458} = (17, 9, 4, 1)$
$128: P_{5475} = (2, 10, 4, 1)$
$129: P_{5533} = (28, 11, 4, 1)$
$130: P_{5561} = (24, 12, 4, 1)$
$131: P_{5591} = (22, 13, 4, 1)$
$132: P_{5617} = (16, 14, 4, 1)$
$133: P_{5638} = (5, 15, 4, 1)$
$134: P_{5679} = (14, 16, 4, 1)$
$135: P_{5706} = (9, 17, 4, 1)$
$136: P_{5760} = (31, 18, 4, 1)$
$137: P_{5790} = (29, 19, 4, 1)$
$138: P_{5820} = (27, 20, 4, 1)$
$139: P_{5848} = (23, 21, 4, 1)$
$140: P_{5870} = (13, 22, 4, 1)$
$141: P_{5910} = (21, 23, 4, 1)$
$142: P_{5933} = (12, 24, 4, 1)$
$143: P_{5959} = (6, 25, 4, 1)$
$144: P_{5985} = (0, 26, 4, 1)$
$145: P_{6037} = (20, 27, 4, 1)$
$146: P_{6060} = (11, 28, 4, 1)$
$147: P_{6100} = (19, 29, 4, 1)$
$148: P_{6121} = (8, 30, 4, 1)$
$149: P_{6163} = (18, 31, 4, 1)$
$150: P_{6190} = (13, 0, 5, 1)$
$151: P_{6259} = (18, 2, 5, 1)$
$152: P_{6303} = (30, 3, 5, 1)$
$153: P_{6320} = (15, 4, 5, 1)$
$154: P_{6381} = (12, 6, 5, 1)$
$155: P_{6409} = (8, 7, 5, 1)$

$156: P_{6440} = (7, 8, 5, 1)$
$157: P_{6494} = (29, 9, 5, 1)$
$158: P_{6528} = (31, 10, 5, 1)$
$159: P_{6549} = (20, 11, 5, 1)$
$160: P_{6567} = (6, 12, 5, 1)$
$161: P_{6593} = (0, 13, 5, 1)$
$162: P_{6648} = (23, 14, 5, 1)$
$163: P_{6661} = (4, 15, 5, 1)$
$164: P_{6710} = (21, 16, 5, 1)$
$165: P_{6740} = (19, 17, 5, 1)$
$166: P_{6755} = (2, 18, 5, 1)$
$167: P_{6802} = (17, 19, 5, 1)$
$168: P_{6828} = (11, 20, 5, 1)$
$169: P_{6865} = (16, 21, 5, 1)$
$170: P_{6907} = (26, 22, 5, 1)$
$171: P_{6927} = (14, 23, 5, 1)$
$172: P_{6970} = (25, 24, 5, 1)$
$173: P_{7001} = (24, 25, 5, 1)$
$174: P_{7031} = (22, 26, 5, 1)$
$175: P_{7069} = (28, 27, 5, 1)$
$176: P_{7100} = (27, 28, 5, 1)$
$177: P_{7114} = (9, 29, 5, 1)$
$178: P_{7140} = (3, 30, 5, 1)$
$179: P_{7179} = (10, 31, 5, 1)$
$180: P_{7219} = (18, 0, 6, 1)$
$181: P_{7278} = (13, 2, 6, 1)$
$182: P_{7306} = (9, 3, 6, 1)$
$183: P_{7354} = (25, 4, 6, 1)$
$184: P_{7373} = (12, 5, 6, 1)$
$185: P_{7442} = (17, 7, 6, 1)$
$186: P_{7476} = (19, 8, 6, 1)$
$187: P_{7492} = (3, 9, 6, 1)$
$188: P_{7543} = (22, 10, 6, 1)$
$189: P_{7574} = (21, 11, 6, 1)$
$190: P_{7590} = (5, 12, 6, 1)$
$191: P_{7619} = (2, 13, 6, 1)$
$192: P_{7676} = (27, 14, 6, 1)$
$193: P_{7705} = (24, 15, 6, 1)$
$194: P_{7733} = (20, 16, 6, 1)$
$195: P_{7752} = (7, 17, 6, 1)$
$196: P_{7777} = (0, 18, 6, 1)$
$197: P_{7817} = (8, 19, 6, 1)$
$198: P_{7857} = (16, 20, 6, 1)$
$199: P_{7884} = (11, 21, 6, 1)$
$200: P_{7915} = (10, 22, 6, 1)$
$201: P_{7965} = (28, 23, 6, 1)$
$202: P_{7984} = (15, 24, 6, 1)$
$203: P_{8005} = (4, 25, 6, 1)$
$204: P_{8064} = (31, 26, 6, 1)$
$205: P_{8079} = (14, 27, 6, 1)$
$206: P_{8120} = (23, 28, 6, 1)$
$207: P_{8159} = (30, 29, 6, 1)$
$208: P_{8190} = (29, 30, 6, 1)$
$209: P_{8219} = (26, 31, 6, 1)$
$210: P_{8239} = (14, 0, 7, 1)$
$211: P_{8317} = (28, 2, 7, 1)$
$212: P_{8325} = (4, 3, 7, 1)$
$213: P_{8356} = (3, 4, 7, 1)$
$214: P_{8393} = (8, 5, 7, 1)$
$215: P_{8434} = (17, 6, 7, 1)$
$216: P_{8486} = (5, 8, 7, 1)$
$217: P_{8538} = (25, 9, 7, 1)$
$218: P_{8556} = (11, 10, 7, 1)$
$219: P_{8587} = (10, 11, 7, 1)$
$220: P_{8628} = (19, 12, 7, 1)$
$221: P_{8664} = (23, 13, 7, 1)$
$222: P_{8673} = (0, 14, 7, 1)$
$223: P_{8735} = (30, 15, 7, 1)$
$224: P_{8763} = (26, 16, 7, 1)$
$225: P_{8775} = (6, 17, 7, 1)$
$226: P_{8828} = (27, 18, 7, 1)$
$227: P_{8845} = (12, 19, 7, 1)$
$228: P_{8896} = (31, 20, 7, 1)$
$229: P_{8919} = (22, 21, 7, 1)$
$230: P_{8950} = (21, 22, 7, 1)$
$231: P_{8974} = (13, 23, 7, 1)$
$232: P_{9022} = (29, 24, 7, 1)$
$233: P_{9034} = (9, 25, 7, 1)$
$234: P_{9073} = (16, 26, 7, 1)$
$235: P_{9107} = (18, 27, 7, 1)$
$236: P_{9123} = (2, 28, 7, 1)$
$237: P_{9177} = (24, 29, 7, 1)$
$238: P_{9200} = (15, 30, 7, 1)$
$239: P_{9237} = (20, 31, 7, 1)$
$240: P_{9272} = (23, 0, 8, 1)$
$241: P_{9340} = (27, 2, 8, 1)$
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647 : $P_{23166} = (29, 18, 21, 1)$
648 : $P_{23200} = (31, 19, 21, 1)$
649 : $P_{23213} = (12, 20, 21, 1)$
650 : $P_{23272} = (7, 22, 21, 1)$
651 : $P_{23301} = (4, 23, 21, 1)$
652 : $P_{23356} = (27, 24, 21, 1)$
653 : $P_{23389} = (28, 25, 21, 1)$
654 : $P_{23401} = (8, 26, 21, 1)$
655 : $P_{23449} = (24, 27, 21, 1)$
656 : $P_{23482} = (25, 28, 21, 1)$
657 : $P_{23507} = (18, 29, 21, 1)$
658 : $P_{23521} = (0, 30, 21, 1)$
659 : $P_{23572} = (19, 31, 21, 1)$
660 : $P_{23600} = (15, 0, 22, 1)$
661 : $P_{23674} = (25, 2, 22, 1)$
662 : $P_{23704} = (23, 3, 22, 1)$
663 : $P_{23726} = (13, 4, 22, 1)$
664 : $P_{23771} = (26, 5, 22, 1)$
665 : $P_{23787} = (10, 6, 22, 1)$
666 : $P_{23830} = (21, 7, 22, 1)$
667 : $P_{23857} = (16, 8, 22, 1)$
668 : $P_{23901} = (28, 9, 22, 1)$
669 : $P_{23911} = (6, 10, 22, 1)$
670 : $P_{23954} = (17, 11, 22, 1)$
671 : $P_{24000} = (31, 12, 22, 1)$
672 : $P_{24005} = (4, 13, 22, 1)$
673 : $P_{24063} = (30, 14, 22, 1)$
674 : $P_{24065} = (0, 15, 22, 1)$
675 : $P_{24105} = (8, 16, 22, 1)$
676 : $P_{24140} = (11, 17, 22, 1)$
677 : $P_{24185} = (24, 18, 22, 1)$
678 : $P_{24213} = (20, 19, 22, 1)$
679 : $P_{24244} = (19, 20, 22, 1)$
680 : $P_{24264} = (7, 21, 22, 1)$
681 : $P_{24324} = (3, 23, 22, 1)$
682 : $P_{24371} = (18, 24, 22, 1)$
683 : $P_{24387} = (2, 25, 22, 1)$
684 : $P_{24422} = (5, 26, 22, 1)$
685 : $P_{24478} = (29, 27, 22, 1)$
686 : $P_{24490} = (9, 28, 22, 1)$
687 : $P_{24540} = (27, 29, 22, 1)$
688 : $P_{24559} = (14, 30, 22, 1)$
689 : $P_{24589} = (12, 31, 22, 1)$
690 : $P_{24617} = (8, 0, 23, 1)$
691 : $P_{24690} = (17, 2, 23, 1)$
692 : $P_{24727} = (22, 3, 23, 1)$
693 : $P_{24758} = (21, 4, 23, 1)$
694 : $P_{24783} = (14, 5, 23, 1)$
695 : $P_{24829} = (28, 6, 23, 1)$

$696: P_{24846} = (13, 7, 23, 1)$
$697: P_{24865} = (0, 8, 23, 1)$
$698: P_{24907} = (10, 9, 23, 1)$
$699: P_{24938} = (9, 10, 23, 1)$
$700: P_{24986} = (25, 11, 23, 1)$
$701: P_{25020} = (27, 12, 23, 1)$
$702: P_{25032} = (7, 13, 23, 1)$
$703: P_{25062} = (5, 14, 23, 1)$
$704: P_{25105} = (16, 15, 23, 1)$
$705: P_{25136} = (15, 16, 23, 1)$
$706: P_{25155} = (2, 17, 23, 1)$
$707: P_{25204} = (19, 18, 23, 1)$
$708: P_{25235} = (18, 19, 23, 1)$
$709: P_{25273} = (24, 20, 23, 1)$
$710: P_{25285} = (4, 21, 23, 1)$
$711: P_{25316} = (3, 22, 23, 1)$
$712: P_{25397} = (20, 24, 23, 1)$
$713: P_{25420} = (11, 25, 23, 1)$
$714: P_{25471} = (30, 26, 23, 1)$
$715: P_{25485} = (12, 27, 23, 1)$
$716: P_{25511} = (6, 28, 23, 1)$
$717: P_{25568} = (31, 29, 23, 1)$
$718: P_{25595} = (26, 30, 23, 1)$
$719: P_{25630} = (29, 31, 23, 1)$
$720: P_{25643} = (10, 0, 24, 1)$
$721: P_{25723} = (26, 2, 24, 1)$
$722: P_{25748} = (19, 3, 24, 1)$
$723: P_{25773} = (12, 4, 24, 1)$
$724: P_{25818} = (25, 5, 24, 1)$
$725: P_{25840} = (15, 6, 24, 1)$
$726: P_{25886} = (29, 7, 24, 1)$
$727: P_{25898} = (9, 8, 24, 1)$
$728: P_{25929} = (8, 9, 24, 1)$
$729: P_{25953} = (0, 10, 24, 1)$
$730: P_{25999} = (14, 11, 24, 1)$
$731: P_{26021} = (4, 12, 24, 1)$
$732: P_{26080} = (31, 13, 24, 1)$
$733: P_{26092} = (11, 14, 24, 1)$
$734: P_{26119} = (6, 15, 24, 1)$
$735: P_{26173} = (28, 16, 24, 1)$
$736: P_{26207} = (30, 17, 24, 1)$
$737: P_{26231} = (22, 18, 24, 1)$
$738: P_{26244} = (3, 19, 24, 1)$
$739: P_{26296} = (23, 20, 24, 1)$
$740: P_{26332} = (27, 21, 24, 1)$
$741: P_{26355} = (18, 22, 24, 1)$
$742: P_{26389} = (20, 23, 24, 1)$
$743: P_{26438} = (5, 25, 24, 1)$
$744: P_{26467} = (2, 26, 24, 1)$
$745: P_{26518} = (21, 27, 24, 1)$
$746: P_{26545} = (16, 28, 24, 1)$
$747: P_{26568} = (7, 29, 24, 1)$
$748: P_{26610} = (17, 30, 24, 1)$
$749: P_{26638} = (13, 31, 24, 1)$
$750: P_{26688} = (31, 0, 25, 1)$
$751: P_{26743} = (22, 2, 25, 1)$
$752: P_{26770} = (17, 3, 25, 1)$
$753: P_{26791} = (6, 4, 25, 1)$
$754: P_{26841} = (24, 5, 25, 1)$
$755: P_{26853} = (4, 6, 25, 1)$
$756: P_{26890} = (9, 7, 25, 1)$
$757: P_{26942} = (29, 8, 25, 1)$
$758: P_{26952} = (7, 9, 25, 1)$
$759: P_{26990} = (13, 10, 25, 1)$
$760: P_{27032} = (23, 11, 25, 1)$
$761: P_{27056} = (15, 12, 25, 1)$
$762: P_{27083} = (10, 13, 25, 1)$
$763: P_{27125} = (20, 14, 25, 1)$
$764: P_{27149} = (12, 15, 25, 1)$
$765: P_{27196} = (27, 16, 25, 1)$
$766: P_{27204} = (3, 17, 25, 1)$
$767: P_{27259} = (26, 18, 25, 1)$
$768: P_{27295} = (30, 19, 25, 1)$
$769: P_{27311} = (14, 20, 25, 1)$
$770: P_{27357} = (28, 21, 25, 1)$
$771: P_{27363} = (2, 22, 25, 1)$
$772: P_{27404} = (11, 23, 25, 1)$
$773: P_{27430} = (5, 24, 25, 1)$
$774: P_{27507} = (18, 26, 25, 1)$
$775: P_{27537} = (16, 27, 25, 1)$
$776: P_{27574} = (21, 28, 25, 1)$
$777: P_{27593} = (8, 29, 25, 1)$
$778: P_{27636} = (19, 30, 25, 1)$
$779: P_{27649} = (0, 31, 25, 1)$
$780: P_{27685} = (4, 0, 26, 1)$
$781: P_{27769} = (24, 2, 26, 1)$
$782: P_{27791} = (14, 3, 26, 1)$
$783: P_{27809} = (0, 4, 26, 1)$
$784: P_{27863} = (22, 5, 26, 1)$
$785: P_{27904} = (31, 6, 26, 1)$
$786: P_{27921} = (16, 7, 26, 1)$
$787: P_{27958} = (21, 8, 26, 1)$
$788: P_{27996} = (27, 9, 26, 1)$
$789: P_{28013} = (12, 10, 26, 1)$
$790: P_{28052} = (19, 11, 26, 1)$
$791: P_{28075} = (10, 12, 26, 1)$
$792: P_{28112} = (15, 13, 26, 1)$
$793: P_{28132} = (3, 14, 26, 1)$
$794: P_{28174} = (13, 15, 26, 1)$
$795: P_{28200} = (7, 16, 26, 1)$
$796: P_{28245} = (20, 17, 26, 1)$
$797: P_{28282} = (25, 18, 26, 1)$
$798: P_{28300} = (11, 19, 26, 1)$
$799: P_{28338} = (17, 20, 26, 1)$
$800: P_{28361} = (8, 21, 26, 1)$
$801: P_{28390} = (5, 22, 26, 1)$
$802: P_{28447} = (30, 23, 26, 1)$
$803: P_{28451} = (2, 24, 26, 1)$

804 : $P_{28499} = (18, 25, 26, 1)$
805 : $P_{28554} = (9, 27, 26, 1)$
806 : $P_{28606} = (29, 28, 26, 1)$
807 : $P_{28637} = (28, 29, 26, 1)$
808 : $P_{28664} = (23, 30, 26, 1)$
809 : $P_{28679} = (6, 31, 26, 1)$
810 : $P_{28722} = (17, 0, 27, 1)$
811 : $P_{28777} = (8, 2, 27, 1)$
812 : $P_{28832} = (31, 3, 27, 1)$
813 : $P_{28853} = (20, 4, 27, 1)$
814 : $P_{28893} = (28, 5, 27, 1)$
815 : $P_{28911} = (14, 6, 27, 1)$
816 : $P_{28947} = (18, 7, 27, 1)$
817 : $P_{28963} = (2, 8, 27, 1)$
818 : $P_{29019} = (26, 9, 27, 1)$
819 : $P_{29055} = (30, 10, 27, 1)$
820 : $P_{29072} = (15, 11, 27, 1)$
821 : $P_{29112} = (23, 12, 27, 1)$
822 : $P_{29140} = (19, 13, 27, 1)$
823 : $P_{29159} = (6, 14, 27, 1)$
824 : $P_{29196} = (11, 15, 27, 1)$
825 : $P_{29242} = (25, 16, 27, 1)$
826 : $P_{29249} = (0, 17, 27, 1)$
827 : $P_{29288} = (7, 18, 27, 1)$
828 : $P_{29326} = (13, 19, 27, 1)$
829 : $P_{29349} = (4, 20, 27, 1)$
830 : $P_{29401} = (24, 21, 27, 1)$
831 : $P_{29438} = (29, 22, 27, 1)$
832 : $P_{29453} = (12, 23, 27, 1)$
833 : $P_{29494} = (21, 24, 27, 1)$
834 : $P_{29521} = (16, 25, 27, 1)$
835 : $P_{29546} = (9, 26, 27, 1)$
836 : $P_{29606} = (5, 28, 27, 1)$
837 : $P_{29655} = (22, 29, 27, 1)$
838 : $P_{29675} = (10, 30, 27, 1)$
839 : $P_{29700} = (3, 31, 27, 1)$
840 : $P_{29748} = (19, 0, 28, 1)$
841 : $P_{29800} = (7, 2, 28, 1)$
842 : $P_{29835} = (10, 3, 28, 1)$
843 : $P_{29868} = (11, 4, 28, 1)$
844 : $P_{29916} = (27, 5, 28, 1)$
845 : $P_{29944} = (23, 6, 28, 1)$
846 : $P_{29955} = (2, 7, 28, 1)$
847 : $P_{30003} = (18, 8, 28, 1)$
848 : $P_{30039} = (22, 9, 28, 1)$
849 : $P_{30052} = (3, 10, 28, 1)$
850 : $P_{30085} = (4, 11, 28, 1)$
851 : $P_{30127} = (14, 12, 28, 1)$
852 : $P_{30162} = (17, 13, 28, 1)$
853 : $P_{30189} = (12, 14, 28, 1)$
854 : $P_{30229} = (20, 15, 28, 1)$
855 : $P_{30265} = (24, 16, 28, 1)$
856 : $P_{30286} = (13, 17, 28, 1)$
857 : $P_{30313} = (8, 18, 28, 1)$
858 : $P_{30337} = (0, 19, 28, 1)$
859 : $P_{30384} = (15, 20, 28, 1)$
860 : $P_{30426} = (25, 21, 28, 1)$
861 : $P_{30442} = (9, 22, 28, 1)$
862 : $P_{30471} = (6, 23, 28, 1)$
863 : $P_{30513} = (16, 24, 28, 1)$
864 : $P_{30550} = (21, 25, 28, 1)$
865 : $P_{30590} = (29, 26, 28, 1)$
866 : $P_{30598} = (5, 27, 28, 1)$
867 : $P_{30683} = (26, 29, 28, 1)$
868 : $P_{30720} = (31, 30, 28, 1)$
869 : $P_{30751} = (30, 31, 28, 1)$
870 : $P_{30764} = (11, 0, 29, 1)$
871 : $P_{30833} = (16, 2, 29, 1)$
872 : $P_{30861} = (12, 3, 29, 1)$
873 : $P_{30900} = (19, 4, 29, 1)$
874 : $P_{30922} = (9, 5, 29, 1)$
875 : $P_{30975} = (30, 6, 29, 1)$
876 : $P_{31001} = (24, 7, 29, 1)$
877 : $P_{31034} = (25, 8, 29, 1)$
878 : $P_{31046} = (5, 9, 29, 1)$
879 : $P_{31087} = (14, 10, 29, 1)$
880 : $P_{31105} = (0, 11, 29, 1)$
881 : $P_{31140} = (3, 12, 29, 1)$
882 : $P_{31189} = (20, 13, 29, 1)$
883 : $P_{31211} = (10, 14, 29, 1)$
884 : $P_{31250} = (17, 15, 29, 1)$
885 : $P_{31267} = (2, 16, 29, 1)$
886 : $P_{31312} = (15, 17, 29, 1)$
887 : $P_{31350} = (21, 18, 29, 1)$
888 : $P_{31365} = (4, 19, 29, 1)$
889 : $P_{31406} = (13, 20, 29, 1)$
890 : $P_{31443} = (18, 21, 29, 1)$
891 : $P_{31484} = (27, 22, 29, 1)$
892 : $P_{31520} = (31, 23, 29, 1)$
893 : $P_{31528} = (7, 24, 29, 1)$
894 : $P_{31561} = (8, 25, 29, 1)$
895 : $P_{31613} = (28, 26, 29, 1)$
896 : $P_{31639} = (22, 27, 29, 1)$
897 : $P_{31675} = (26, 28, 29, 1)$
898 : $P_{31719} = (6, 30, 29, 1)$
899 : $P_{31768} = (23, 31, 29, 1)$
900 : $P_{31798} = (21, 0, 30, 1)$
901 : $P_{31861} = (20, 2, 30, 1)$
902 : $P_{31878} = (5, 3, 30, 1)$
903 : $P_{31913} = (8, 4, 30, 1)$
904 : $P_{31940} = (3, 5, 30, 1)$
905 : $P_{31998} = (29, 6, 30, 1)$
906 : $P_{32016} = (15, 7, 30, 1)$
907 : $P_{32037} = (4, 8, 30, 1)$
908 : $P_{32077} = (12, 9, 30, 1)$
909 : $P_{32124} = (27, 10, 30, 1)$
910 : $P_{32147} = (18, 11, 30, 1)$
911 : $P_{32170} = (9, 12, 30, 1)$

912 : $P_{32209} = (16, 13, 30, 1)$
913 : $P_{32247} = (22, 14, 30, 1)$
914 : $P_{32264} = (7, 15, 30, 1)$
915 : $P_{32302} = (13, 16, 30, 1)$
916 : $P_{32345} = (24, 17, 30, 1)$
917 : $P_{32364} = (11, 18, 30, 1)$
918 : $P_{32410} = (25, 19, 30, 1)$
919 : $P_{32419} = (2, 20, 30, 1)$
920 : $P_{32449} = (0, 21, 30, 1)$
921 : $P_{32495} = (14, 22, 30, 1)$
922 : $P_{32539} = (26, 23, 30, 1)$
923 : $P_{32562} = (17, 24, 30, 1)$
924 : $P_{32596} = (19, 25, 30, 1)$
925 : $P_{32632} = (23, 26, 30, 1)$
926 : $P_{32651} = (10, 27, 30, 1)$
927 : $P_{32704} = (31, 28, 30, 1)$
928 : $P_{32711} = (6, 29, 30, 1)$
929 : $P_{32797} = (28, 31, 30, 1)$
930 : $P_{32826} = (25, 0, 31, 1)$
931 : $P_{32880} = (15, 2, 31, 1)$
932 : $P_{32924} = (27, 3, 31, 1)$
933 : $P_{32947} = (18, 4, 31, 1)$
934 : $P_{32971} = (10, 5, 31, 1)$
935 : $P_{33019} = (26, 6, 31, 1)$
936 : $P_{33045} = (20, 7, 31, 1)$
937 : $P_{33068} = (11, 8, 31, 1)$
938 : $P_{33103} = (14, 9, 31, 1)$
939 : $P_{33126} = (5, 10, 31, 1)$
940 : $P_{33161} = (8, 11, 31, 1)$
941 : $P_{33207} = (22, 12, 31, 1)$
942 : $P_{33241} = (24, 13, 31, 1)$
943 : $P_{33258} = (9, 14, 31, 1)$
944 : $P_{33283} = (2, 15, 31, 1)$
945 : $P_{33330} = (17, 16, 31, 1)$
946 : $P_{33361} = (16, 17, 31, 1)$
947 : $P_{33381} = (4, 18, 31, 1)$
948 : $P_{33430} = (21, 19, 31, 1)$
949 : $P_{33448} = (7, 20, 31, 1)$
950 : $P_{33492} = (19, 21, 31, 1)$
951 : $P_{33517} = (12, 22, 31, 1)$
952 : $P_{33566} = (29, 23, 31, 1)$
953 : $P_{33582} = (13, 24, 31, 1)$
954 : $P_{33601} = (0, 25, 31, 1)$
955 : $P_{33639} = (6, 26, 31, 1)$
956 : $P_{33668} = (3, 27, 31, 1)$
957 : $P_{33727} = (30, 28, 31, 1)$
958 : $P_{33752} = (23, 29, 31, 1)$
959 : $P_{33789} = (28, 30, 31, 1)$

Line Intersection Graph

	0	1	2
0	0	1	1
1	1	0	1
2	1	1	0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line	ℓ_1	ℓ_2
in point	P_4	P_4

Line 1 intersects

Line	ℓ_0	ℓ_2
in point	P_4	P_4

Line 2 intersects

Line	ℓ_0	ℓ_1
in point	P_4	P_4

The surface has 1057 points:
Too many to print.