Rank-65735 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

$$X_2^3 + X_0^2X_3 + X_0X_1^2 + X_0X_1X_2 = 0$$

(0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(8) is 1229492877

General information

Number of lines	1
Number of points	73
Number of singular points	1
Number of Eckardt points	0
Number of double points	0
Number of single points	9
Number of points off lines	64
Number of Hesse planes	0
Number of axes	0
Type of points on lines	9
Type of lines on points	1^9, 0^{64}

Singular Points

The surface has 1 singular points:

$0 : \ P_3 = \mathbf{P}(0,0,0,1) = \mathbf{P}(0,0,0,1)$

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4680} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4680} = \mathbf{Pl}(0,0,0,1,0,0)_{17}$$

Rank of lines: (4680)
Rank of points on Klein quadric: (17)

Eckardt Points

The surface has 0 Eckardt points:

Double Points

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

Single Points

The surface has 9 single points:
The single points on the surface are:

$0:\ P_1 = (0,1,0,0)$ lies on line ℓ_0
$1:\ P_3 = (0,0,0,1)$ lies on line ℓ_0
$2:\ P_{82} = (0,1,0,1)$ lies on line ℓ_0
$3:\ P_{90} = (0,2,0,1)$ lies on line ℓ_0
$4:\ P_{98} = (0,3,0,1)$ lies on line ℓ_0
$5:\ P_{106} = (0,4,0,1)$ lies on line ℓ_0
$6:\ P_{114} = (0,5,0,1)$ lies on line ℓ_0
$7:\ P_{122} = (0,6,0,1)$ lies on line ℓ_0
$8:\ P_{130} = (0,7,0,1)$ lies on line ℓ_0

The single points on the surface are:

Points on surface but on no line

The surface has 64 points not on any line:
The points on the surface but not on lines are:

$0:\ P_0 = (1,0,0,0)$
$1:\ P_4 = (1,1,1,1)$
$2:\ P_{29} = (2,2,1,0)$
$3:\ P_{37} = (2,3,1,0)$
$4:\ P_{47} = (4,4,1,0)$
$5:\ P_{55} = (4,5,1,0)$
$6:\ P_{66} = (7,6,1,0)$
$7:\ P_{74} = (7,7,1,0)$
$8:\ P_{83} = (1,1,0,1)$
$9:\ P_{94} = (4,2,0,1)$
$10:\ P_{103} = (5,3,0,1)$
$11:\ P_{113} = (7,4,0,1)$
$12:\ P_{120} = (6,5,0,1)$
$13:\ P_{125} = (3,6,0,1)$
$14:\ P_{132} = (2,7,0,1)$
$15:\ P_{139} = (1,0,1,1)$
$16:\ P_{204} = (3,0,2,1)$
$17:\ P_{220} = (3,2,2,1)$
$18:\ P_{247} = (6,5,2,1)$
$19:\ P_{248} = (7,5,2,1)$
$20:\ P_{263} = (6,7,2,1)$
$21:\ P_{264} = (7,7,2,1)$
$22:\ P_{272} = (7,0,3,1)$
$23:\ P_{277} = (4,1,3,1)$
$24:\ P_{279} = (6,1,3,1)$
$25:\ P_{285} = (4,2,3,1)$
$26:\ P_{287} = (6,2,3,1)$
$27:\ P_{296} = (7,3,3,1)$
$28:\ P_{300} = (3,4,3,1)$
$29:\ P_{302} = (5,4,3,1)$
$30:\ P_{324} = (3,7,3,1)$
$31:\ P_{326} = (5,7,3,1)$
$32:\ P_{334} = (5,0,4,1)$
$33:\ P_{347} = (2,2,4,1)$
$34:\ P_{348} = (3,2,4,1)$
$35:\ P_{366} = (5,4,4,1)$

36 : $P_{379} = (2, 6, 4, 1)$
37 : $P_{380} = (3, 6, 4, 1)$
38 : $P_{395} = (2, 0, 5, 1)$
39 : $P_{404} = (3, 1, 5, 1)$
40 : $P_{408} = (7, 1, 5, 1)$
41 : $P_{414} = (5, 2, 5, 1)$
42 : $P_{415} = (6, 2, 5, 1)$
43 : $P_{428} = (3, 4, 5, 1)$
44 : $P_{432} = (7, 4, 5, 1)$
45 : $P_{435} = (2, 5, 5, 1)$
46 : $P_{454} = (5, 7, 5, 1)$
47 : $P_{455} = (6, 7, 5, 1)$
48 : $P_{461} = (4, 0, 6, 1)$
49 : $P_{467} = (2, 1, 6, 1)$
50 : $P_{470} = (5, 1, 6, 1)$
51 : $P_{476} = (3, 2, 6, 1)$
52 : $P_{479} = (6, 2, 6, 1)$
53 : $P_{492} = (3, 4, 6, 1)$
54 : $P_{495} = (6, 4, 6, 1)$
55 : $P_{509} = (4, 6, 6, 1)$
56 : $P_{515} = (2, 7, 6, 1)$
57 : $P_{518} = (5, 7, 6, 1)$
58 : $P_{527} = (6, 0, 7, 1)$
59 : $P_{549} = (4, 3, 7, 1)$
60 : $P_{550} = (5, 3, 7, 1)$
61 : $P_{557} = (4, 4, 7, 1)$
62 : $P_{558} = (5, 4, 7, 1)$
63 : $P_{583} = (6, 7, 7, 1)$

Line Intersection Graph

	0
0	0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line
in point

The surface has 73 points:
The points on the surface are:

0 : $P_{0} = (1, 0, 0, 0)$
1 : $P_{1} = (0, 1, 0, 0)$
2 : $P_{3} = (0, 0, 0, 1)$
3 : $P_{4} = (1, 1, 1, 1)$
4 : $P_{29} = (2, 2, 1, 0)$
5 : $P_{37} = (2, 3, 1, 0)$
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17 : $P_{113} = (7, 4, 0, 1)$
18 : $P_{114} = (0, 5, 0, 1)$
19 : $P_{120} = (6, 5, 0, 1)$
20 : $P_{122} = (0, 6, 0, 1)$
21 : $P_{125} = (3, 6, 0, 1)$
22 : $P_{130} = (0, 7, 0, 1)$
23 : $P_{132} = (2, 7, 0, 1)$
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