

Rank-65743 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

(0, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0)

The point rank of the equation over GF(8) is 1229493389

General information

Number of lines	1
Number of points	65
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	56
Number of Hesse planes	0
Number of axes	0
Type of points on lines	9
Type of lines on points	$1^9, 0^{56}$

Singular Points

The surface has 1 singular points:

$$0 : P_{75} = \mathbf{P}(1, 0, 0, 1) = \mathbf{P}(1, 0, 0, 1)$$

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{4673} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{4673} = \mathbf{Pl}(0, 0, 0, 1, 0, 1)_{769}$$

Rank of lines: (4673)

Rank of points on Klein quadric: (769)

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 : $P_{138} = (0, 0, 1, 1)$ lies on line ℓ_0
- 2 : $P_{146} = (0, 1, 1, 1)$ lies on line ℓ_0
- 3 : $P_{153} = (0, 2, 1, 1)$ lies on line ℓ_0
- 4 : $P_{161} = (0, 3, 1, 1)$ lies on line ℓ_0

- 5 : $P_{169} = (0, 4, 1, 1)$ lies on line ℓ_0
- 6 : $P_{177} = (0, 5, 1, 1)$ lies on line ℓ_0
- 7 : $P_{185} = (0, 6, 1, 1)$ lies on line ℓ_0
- 8 : $P_{193} = (0, 7, 1, 1)$ lies on line ℓ_0

The single points on the surface are:

Points on surface but on no line

The surface has 56 points not on any line:

The points on the surface but not on lines are:

- | | |
|-------------------------------|-------------------------------|
| 0 : $P_0 = (1, 0, 0, 0)$ | 18 : $P_{190} = (5, 6, 1, 1)$ |
| 1 : $P_{29} = (2, 2, 1, 0)$ | 19 : $P_{198} = (5, 7, 1, 1)$ |
| 2 : $P_{37} = (2, 3, 1, 0)$ | 20 : $P_{203} = (2, 0, 2, 1)$ |
| 3 : $P_{47} = (4, 4, 1, 0)$ | 21 : $P_{214} = (5, 1, 2, 1)$ |
| 4 : $P_{55} = (4, 5, 1, 0)$ | 22 : $P_{215} = (6, 1, 2, 1)$ |
| 5 : $P_{66} = (7, 6, 1, 0)$ | 23 : $P_{219} = (2, 2, 2, 1)$ |
| 6 : $P_{74} = (7, 7, 1, 0)$ | 24 : $P_{230} = (5, 3, 2, 1)$ |
| 7 : $P_{75} = (1, 0, 0, 1)$ | 25 : $P_{231} = (6, 3, 2, 1)$ |
| 8 : $P_{92} = (2, 2, 0, 1)$ | 26 : $P_{271} = (6, 0, 3, 1)$ |
| 9 : $P_{96} = (6, 2, 0, 1)$ | 27 : $P_{274} = (1, 1, 3, 1)$ |
| 10 : $P_{109} = (3, 4, 0, 1)$ | 28 : $P_{276} = (3, 1, 3, 1)$ |
| 11 : $P_{110} = (4, 4, 0, 1)$ | 29 : $P_{282} = (1, 2, 3, 1)$ |
| 12 : $P_{135} = (5, 7, 0, 1)$ | 30 : $P_{284} = (3, 2, 3, 1)$ |
| 13 : $P_{137} = (7, 7, 0, 1)$ | 31 : $P_{295} = (6, 3, 3, 1)$ |
| 14 : $P_{159} = (6, 2, 1, 1)$ | 32 : $P_{333} = (4, 0, 4, 1)$ |
| 15 : $P_{167} = (6, 3, 1, 1)$ | 33 : $P_{340} = (3, 1, 4, 1)$ |
| 16 : $P_{172} = (3, 4, 1, 1)$ | 34 : $P_{343} = (6, 1, 4, 1)$ |
| 17 : $P_{180} = (3, 5, 1, 1)$ | 35 : $P_{365} = (4, 4, 4, 1)$ |

36 : $P_{372} = (3, 5, 4, 1)$
 37 : $P_{375} = (6, 5, 4, 1)$
 38 : $P_{396} = (3, 0, 5, 1)$
 39 : $P_{402} = (1, 1, 5, 1)$
 40 : $P_{406} = (5, 1, 5, 1)$
 41 : $P_{426} = (1, 4, 5, 1)$
 42 : $P_{430} = (5, 4, 5, 1)$
 43 : $P_{436} = (3, 5, 5, 1)$
 44 : $P_{462} = (5, 0, 6, 1)$
 45 : $P_{466} = (1, 1, 6, 1)$
 46 : $P_{471} = (6, 1, 6, 1)$

47 : $P_{510} = (5, 6, 6, 1)$
 48 : $P_{514} = (1, 7, 6, 1)$
 49 : $P_{519} = (6, 7, 6, 1)$
 50 : $P_{528} = (7, 0, 7, 1)$
 51 : $P_{532} = (3, 1, 7, 1)$
 52 : $P_{534} = (5, 1, 7, 1)$
 53 : $P_{572} = (3, 6, 7, 1)$
 54 : $P_{574} = (5, 6, 7, 1)$
 55 : $P_{584} = (7, 7, 7, 1)$

Line Intersection Graph

$$\begin{array}{c|c} 0 & \\ \hline 0 & 0 \end{array}$$

Neighbor sets in the line intersection graph:

Line 0 intersects

Line
in point

The surface has 65 points:

The points on the surface are:

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