

Rank-66763 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

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

The point rank of the equation over GF(8) is -1991732147

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:

$$\ell_0 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{4672} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{4672} = \mathbf{Pl}(0, 0, 0, 0, 0, 1)_{649}$$

Rank of lines: (4672)

Rank of points on Klein quadric: (649)

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 : $P_2 = (0, 0, 1, 0)$ lies on line ℓ_0
- 2 : $P_{19} = (0, 1, 1, 0)$ lies on line ℓ_0
- 3 : $P_{27} = (0, 2, 1, 0)$ lies on line ℓ_0
- 4 : $P_{35} = (0, 3, 1, 0)$ lies on line ℓ_0

- 5 : $P_{43} = (0, 4, 1, 0)$ lies on line ℓ_0
- 6 : $P_{51} = (0, 5, 1, 0)$ lies on line ℓ_0
- 7 : $P_{59} = (0, 6, 1, 0)$ lies on line ℓ_0
- 8 : $P_{67} = (0, 7, 1, 0)$ 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 : $P_{195} = (2, 7, 1, 1)$ |
| 1 : $P_{75} = (1, 0, 0, 1)$ | 19 : $P_{199} = (6, 7, 1, 1)$ |
| 2 : $P_{92} = (2, 2, 0, 1)$ | 20 : $P_{203} = (2, 0, 2, 1)$ |
| 3 : $P_{96} = (6, 2, 0, 1)$ | 21 : $P_{207} = (6, 0, 2, 1)$ |
| 4 : $P_{109} = (3, 4, 0, 1)$ | 22 : $P_{212} = (3, 1, 2, 1)$ |
| 5 : $P_{110} = (4, 4, 0, 1)$ | 23 : $P_{213} = (4, 1, 2, 1)$ |
| 6 : $P_{135} = (5, 7, 0, 1)$ | 24 : $P_{219} = (2, 2, 2, 1)$ |
| 7 : $P_{137} = (7, 7, 0, 1)$ | 25 : $P_{223} = (6, 2, 2, 1)$ |
| 8 : $P_{156} = (3, 2, 1, 1)$ | 26 : $P_{228} = (3, 3, 2, 1)$ |
| 9 : $P_{157} = (4, 2, 1, 1)$ | 27 : $P_{229} = (4, 3, 2, 1)$ |
| 10 : $P_{164} = (3, 3, 1, 1)$ | 28 : $P_{276} = (3, 1, 3, 1)$ |
| 11 : $P_{165} = (4, 3, 1, 1)$ | 29 : $P_{277} = (4, 1, 3, 1)$ |
| 12 : $P_{174} = (5, 4, 1, 1)$ | 30 : $P_{284} = (3, 2, 3, 1)$ |
| 13 : $P_{176} = (7, 4, 1, 1)$ | 31 : $P_{285} = (4, 2, 3, 1)$ |
| 14 : $P_{182} = (5, 5, 1, 1)$ | 32 : $P_{332} = (3, 0, 4, 1)$ |
| 15 : $P_{184} = (7, 5, 1, 1)$ | 33 : $P_{333} = (4, 0, 4, 1)$ |
| 16 : $P_{187} = (2, 6, 1, 1)$ | 34 : $P_{342} = (5, 1, 4, 1)$ |
| 17 : $P_{191} = (6, 6, 1, 1)$ | 35 : $P_{344} = (7, 1, 4, 1)$ |

36 : $P_{364} = (3, 4, 4, 1)$
 37 : $P_{365} = (4, 4, 4, 1)$
 38 : $P_{374} = (5, 5, 4, 1)$
 39 : $P_{376} = (7, 5, 4, 1)$
 40 : $P_{406} = (5, 1, 5, 1)$
 41 : $P_{408} = (7, 1, 5, 1)$
 42 : $P_{430} = (5, 4, 5, 1)$
 43 : $P_{432} = (7, 4, 5, 1)$
 44 : $P_{467} = (2, 1, 6, 1)$
 45 : $P_{471} = (6, 1, 6, 1)$
 46 : $P_{515} = (2, 7, 6, 1)$

47 : $P_{519} = (6, 7, 6, 1)$
 48 : $P_{526} = (5, 0, 7, 1)$
 49 : $P_{528} = (7, 0, 7, 1)$
 50 : $P_{531} = (2, 1, 7, 1)$
 51 : $P_{535} = (6, 1, 7, 1)$
 52 : $P_{571} = (2, 6, 7, 1)$
 53 : $P_{575} = (6, 6, 7, 1)$
 54 : $P_{582} = (5, 7, 7, 1)$
 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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