

Rank-73798 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

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

The point rank of the equation over GF(8) is 1227395670

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:

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

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4744} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4744} = \mathbf{P}\mathbf{l}(0, 1, 0, 0, 0, 0)_1$$

Rank of lines: (4744)
Rank of points on Klein quadric: (1)

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 : $P_2 = (0, 0, 1, 0)$ lies on line ℓ_0 | 5 : $P_{329} = (0, 0, 4, 1)$ lies on line ℓ_0 |
| 1 : $P_3 = (0, 0, 0, 1)$ lies on line ℓ_0 | 6 : $P_{393} = (0, 0, 5, 1)$ lies on line ℓ_0 |
| 2 : $P_{138} = (0, 0, 1, 1)$ lies on line ℓ_0 | 7 : $P_{457} = (0, 0, 6, 1)$ lies on line ℓ_0 |
| 3 : $P_{201} = (0, 0, 2, 1)$ lies on line ℓ_0 | 8 : $P_{521} = (0, 0, 7, 1)$ lies on line ℓ_0 |
| 4 : $P_{265} = (0, 0, 3, 1)$ 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 : $P_5 = (1, 1, 0, 0)$ | 18 : $P_{162} = (1, 3, 1, 1)$ |
| 1 : $P_{22} = (3, 1, 1, 0)$ | 19 : $P_{168} = (7, 3, 1, 1)$ |
| 2 : $P_{24} = (5, 1, 1, 0)$ | 20 : $P_{171} = (2, 4, 1, 1)$ |
| 3 : $P_{25} = (6, 1, 1, 0)$ | 21 : $P_{178} = (1, 5, 1, 1)$ |
| 4 : $P_{36} = (1, 3, 1, 0)$ | 22 : $P_{179} = (2, 5, 1, 1)$ |
| 5 : $P_{52} = (1, 5, 1, 0)$ | 23 : $P_{186} = (1, 6, 1, 1)$ |
| 6 : $P_{60} = (1, 6, 1, 0)$ | 24 : $P_{189} = (4, 6, 1, 1)$ |
| 7 : $P_{83} = (1, 1, 0, 1)$ | 25 : $P_{197} = (4, 7, 1, 1)$ |
| 8 : $P_{94} = (4, 2, 0, 1)$ | 26 : $P_{218} = (1, 2, 2, 1)$ |
| 9 : $P_{104} = (6, 3, 0, 1)$ | 27 : $P_{220} = (3, 2, 2, 1)$ |
| 10 : $P_{113} = (7, 4, 0, 1)$ | 28 : $P_{227} = (2, 3, 2, 1)$ |
| 11 : $P_{117} = (3, 5, 0, 1)$ | 29 : $P_{236} = (3, 4, 2, 1)$ |
| 12 : $P_{127} = (5, 6, 0, 1)$ | 30 : $P_{237} = (4, 4, 2, 1)$ |
| 13 : $P_{132} = (2, 7, 0, 1)$ | 31 : $P_{239} = (6, 4, 2, 1)$ |
| 14 : $P_{147} = (2, 1, 1, 1)$ | 32 : $P_{248} = (7, 5, 2, 1)$ |
| 15 : $P_{149} = (4, 1, 1, 1)$ | 33 : $P_{252} = (3, 6, 2, 1)$ |
| 16 : $P_{152} = (7, 1, 1, 1)$ | 34 : $P_{276} = (3, 1, 3, 1)$ |
| 17 : $P_{160} = (7, 2, 1, 1)$ | 35 : $P_{319} = (6, 6, 3, 1)$ |

36 : $P_{358} = (5, 3, 4, 1)$
 37 : $P_{362} = (1, 4, 4, 1)$
 38 : $P_{366} = (5, 4, 4, 1)$
 39 : $P_{373} = (4, 5, 4, 1)$
 40 : $P_{379} = (2, 6, 4, 1)$
 41 : $P_{388} = (3, 7, 4, 1)$
 42 : $P_{390} = (5, 7, 4, 1)$
 43 : $P_{392} = (7, 7, 4, 1)$
 44 : $P_{406} = (5, 1, 5, 1)$
 45 : $P_{420} = (3, 3, 5, 1)$
 46 : $P_{471} = (6, 1, 6, 1)$

47 : $P_{502} = (5, 5, 6, 1)$
 48 : $P_{539} = (2, 2, 7, 1)$
 49 : $P_{542} = (5, 2, 7, 1)$
 50 : $P_{543} = (6, 2, 7, 1)$
 51 : $P_{549} = (4, 3, 7, 1)$
 52 : $P_{567} = (6, 5, 7, 1)$
 53 : $P_{576} = (7, 6, 7, 1)$
 54 : $P_{578} = (1, 7, 7, 1)$
 55 : $P_{583} = (6, 7, 7, 1)$

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:

0 : $P_2 = (0, 0, 1, 0)$
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 4 : $P_{24} = (5, 1, 1, 0)$
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 62 : $P_{576} = (7, 6, 7, 1)$
 63 : $P_{578} = (1, 7, 7, 1)$
 64 : $P_{583} = (6, 7, 7, 1)$