

Rank-65839 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

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

The point rank of the equation over GF(8) is 1243944077

General information

Number of lines	1
Number of points	73
Number of singular points	0
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 0 singular points:

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}_0 = \mathbf{Pl}(1, 0, 0, 0, 0, 0)_0$$

Rank of lines: (0)

Rank of points on Klein quadric: (0)

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 : $P_0 = (1, 0, 0, 0)$ lies on line ℓ_0
- 1 : $P_1 = (0, 1, 0, 0)$ lies on line ℓ_0
- 2 : $P_5 = (1, 1, 0, 0)$ lies on line ℓ_0
- 3 : $P_6 = (2, 1, 0, 0)$ lies on line ℓ_0
- 4 : $P_7 = (3, 1, 0, 0)$ lies on line ℓ_0

- 5 : $P_8 = (4, 1, 0, 0)$ lies on line ℓ_0
- 6 : $P_9 = (5, 1, 0, 0)$ lies on line ℓ_0
- 7 : $P_{10} = (6, 1, 0, 0)$ lies on line ℓ_0
- 8 : $P_{11} = (7, 1, 0, 0)$ 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 : $P_{12} = (1, 0, 1, 0)$ | 22 : $P_{294} = (5, 3, 3, 1)$ |
| 1 : $P_{19} = (0, 1, 1, 0)$ | 23 : $P_{295} = (6, 3, 3, 1)$ |
| 2 : $P_{20} = (1, 1, 1, 0)$ | 24 : $P_{308} = (3, 5, 3, 1)$ |
| 3 : $P_{40} = (5, 3, 1, 0)$ | 25 : $P_{311} = (6, 5, 3, 1)$ |
| 4 : $P_{41} = (6, 3, 1, 0)$ | 26 : $P_{316} = (3, 6, 3, 1)$ |
| 5 : $P_{54} = (3, 5, 1, 0)$ | 27 : $P_{318} = (5, 6, 3, 1)$ |
| 6 : $P_{57} = (6, 5, 1, 0)$ | 28 : $P_{331} = (2, 0, 4, 1)$ |
| 7 : $P_{62} = (3, 6, 1, 0)$ | 29 : $P_{343} = (6, 1, 4, 1)$ |
| 8 : $P_{64} = (5, 6, 1, 0)$ | 30 : $P_{344} = (7, 1, 4, 1)$ |
| 9 : $P_{138} = (0, 0, 1, 1)$ | 31 : $P_{345} = (0, 2, 4, 1)$ |
| 10 : $P_{208} = (7, 0, 2, 1)$ | 32 : $P_{347} = (2, 2, 4, 1)$ |
| 11 : $P_{213} = (4, 1, 2, 1)$ | 33 : $P_{378} = (1, 6, 4, 1)$ |
| 12 : $P_{214} = (5, 1, 2, 1)$ | 34 : $P_{384} = (7, 6, 4, 1)$ |
| 13 : $P_{234} = (1, 4, 2, 1)$ | 35 : $P_{386} = (1, 7, 4, 1)$ |
| 14 : $P_{238} = (5, 4, 2, 1)$ | 36 : $P_{391} = (6, 7, 4, 1)$ |
| 15 : $P_{242} = (1, 5, 2, 1)$ | 37 : $P_{394} = (1, 0, 5, 1)$ |
| 16 : $P_{245} = (4, 5, 2, 1)$ | 38 : $P_{401} = (0, 1, 5, 1)$ |
| 17 : $P_{257} = (0, 7, 2, 1)$ | 39 : $P_{402} = (1, 1, 5, 1)$ |
| 18 : $P_{264} = (7, 7, 2, 1)$ | 40 : $P_{422} = (5, 3, 5, 1)$ |
| 19 : $P_{266} = (1, 0, 3, 1)$ | 41 : $P_{423} = (6, 3, 5, 1)$ |
| 20 : $P_{273} = (0, 1, 3, 1)$ | 42 : $P_{436} = (3, 5, 5, 1)$ |
| 21 : $P_{274} = (1, 1, 3, 1)$ | 43 : $P_{439} = (6, 5, 5, 1)$ |

44 : $P_{444} = (3, 6, 5, 1)$
 45 : $P_{446} = (5, 6, 5, 1)$
 46 : $P_{458} = (1, 0, 6, 1)$
 47 : $P_{465} = (0, 1, 6, 1)$
 48 : $P_{466} = (1, 1, 6, 1)$
 49 : $P_{486} = (5, 3, 6, 1)$
 50 : $P_{487} = (6, 3, 6, 1)$
 51 : $P_{500} = (3, 5, 6, 1)$
 52 : $P_{503} = (6, 5, 6, 1)$
 53 : $P_{508} = (3, 6, 6, 1)$
 54 : $P_{510} = (5, 6, 6, 1)$

55 : $P_{525} = (4, 0, 7, 1)$
 56 : $P_{531} = (2, 1, 7, 1)$
 57 : $P_{532} = (3, 1, 7, 1)$
 58 : $P_{538} = (1, 2, 7, 1)$
 59 : $P_{540} = (3, 2, 7, 1)$
 60 : $P_{546} = (1, 3, 7, 1)$
 61 : $P_{547} = (2, 3, 7, 1)$
 62 : $P_{553} = (0, 4, 7, 1)$
 63 : $P_{557} = (4, 4, 7, 1)$

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 73 points:

The points on the surface are:

0 : $P_0 = (1, 0, 0, 0)$
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 3 : $P_6 = (2, 1, 0, 0)$
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