

# Rank-65899 over GF(2)

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## The equation

The equation of the surface is :

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

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

The point rank of the equation over GF(2) is 65899

## General information

Number of lines	2
Number of points	7
Number of singular points	1
Number of Eckardt points	0
Number of double points	1
Number of single points	4
Number of points off lines	2
Number of Hesse planes	0
Number of axes	0
Type of points on lines	$3^2$
Type of lines on points	$2, 1^4, 0^2$

## Singular Points

The surface has 1 singular points:

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

## The 2 Lines

The lines and their Pluecker coordinates are:

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

$$\ell_1 = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}_{14} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}_{14} = \mathbf{PI}(1, 0, 0, 1, 0, 0)_6$$

Rank of lines: ( 0, 14 )

Rank of points on Klein quadric: ( 0, 6 )

### Eckardt Points

The surface has 0 Eckardt points:

### Double Points

The surface has 1 Double points:

The double points on the surface are:

$$P_1 = (0, 1, 0, 0) = \ell_0 \cap \ell_1$$

### Single Points

The surface has 4 single points:

The single points on the surface are:

0 :  $P_0 = (1, 0, 0, 0)$  lies on line  $\ell_0$

1 :  $P_5 = (1, 1, 0, 0)$  lies on line  $\ell_0$

2 :  $P_9 = (1, 0, 0, 1)$  lies on line  $\ell_1$

3 :  $P_{11} = (1, 1, 0, 1)$  lies on line  $\ell_1$

The single points on the surface are:

### Points on surface but on no line

The surface has 2 points not on any line:

The points on the surface but not on lines are:

0 :  $P_2 = (0, 0, 1, 0)$

1 :  $P_{14} = (0, 1, 1, 1)$

### Line Intersection Graph

$$\begin{array}{c|c} 0 & 1 \\ \hline 0 & 0 \\ 1 & 1 \end{array}$$

Neighbor sets in the line intersection graph:

Line 0 intersects

Line	$\ell_1$
in point	$P_1$

Line 1 intersects

Line	$\ell_0$
in point	$P_1$

The surface has 7 points:

The points on the surface are:

$$\begin{aligned} 0 : P_0 &= (1, 0, 0, 0) \\ 1 : P_1 &= (0, 1, 0, 0) \\ 2 : P_2 &= (0, 0, 1, 0) \end{aligned}$$

$$\begin{aligned} 3 : P_5 &= (1, 1, 0, 0) \\ 4 : P_9 &= (1, 0, 0, 1) \\ 5 : P_{11} &= (1, 1, 0, 1) \end{aligned}$$

$$6 : P_{14} = (0, 1, 1, 1)$$