

# Rank-192 over GF(64)

January 15, 2021

## The equation

The equation of the surface is :

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

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

The point rank of the equation over GF(64) is -2113658802

## General information

Number of lines	65
Number of points	4161
Number of singular points	1
Number of Eckardt points	0
Number of double points	0
Number of single points	4160
Number of points off lines	0
Number of Hesse planes	0
Number of axes	0
Type of points on lines	$65^{65}$
Type of lines on points	$65, 1^{4160}$

## Singular Points

The surface has 1 singular points:

$$0 : P_3 = \mathbf{P}(0, 0, 0, 1) = \mathbf{P}(0, 0, 0, 1)$$

## The 65 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4160} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4160} = \mathbf{P}\mathbf{l}(0, 0, 0, 0, 1, 0)_{4225}$$

$$\begin{aligned}
\ell_1 &= \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{17043520} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{17043520} = \mathbf{Pl}(0, 0, 0, 1, 0, 0)_{129} \\
\ell_2 &= \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{8321} = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{8321} = \mathbf{Pl}(0, 0, 0, 1, 1, 0)_{12353} \\
\ell_3 &= \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{270464} = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{270464} = \mathbf{Pl}(0, 1, 0, 0, 1, 0)_{4289} \\
\ell_4 &= \begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{274625} = \begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{274625} = \mathbf{Pl}(0, 1, 0, 1, 1, 0)_{12417} \\
\ell_5 &= \begin{bmatrix} 1 & \epsilon^{16} & \epsilon^{15} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{5771306} = \begin{bmatrix} 1 & 42 & 21 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{5771306} = \mathbf{Pl}(0, 21, 0, 42, 1, 0)_{17644} \\
\ell_6 &= \begin{bmatrix} 1 & \epsilon^{44} & \epsilon^{43} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4672802} = \begin{bmatrix} 1 & 34 & 17 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4672802} = \mathbf{Pl}(0, 17, 0, 34, 1, 0)_{16624} \\
\ell_7 &= \begin{bmatrix} 1 & \epsilon^{25} & \epsilon^{23} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{10369211} = \begin{bmatrix} 1 & 59 & 38 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{10369211} = \mathbf{Pl}(0, 38, 0, 59, 1, 0)_{19820} \\
\ell_8 &= \begin{bmatrix} 1 & \epsilon^{32} & \epsilon^{30} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{14492762} = \begin{bmatrix} 1 & 26 & 54 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{14492762} = \mathbf{Pl}(0, 54, 0, 26, 1, 0)_{15645} \\
\ell_9 &= \begin{bmatrix} 1 & \epsilon^{41} & \epsilon^{45} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{9973916} = \begin{bmatrix} 1 & 28 & 37 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{9973916} = \mathbf{Pl}(0, 37, 0, 28, 1, 0)_{15882} \\
\ell_{10} &= \begin{bmatrix} 1 & \epsilon^{53} & \epsilon^{57} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{13073861} = \begin{bmatrix} 1 & 5 & 49 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{13073861} = \mathbf{Pl}(0, 49, 0, 5, 1, 0)_{12973} \\
\ell_{11} &= \begin{bmatrix} 1 & \epsilon^{21} & \epsilon^{18} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3170681} = \begin{bmatrix} 1 & 57 & 11 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3170681} = \mathbf{Pl}(0, 11, 0, 57, 1, 0)_{19539} \\
\ell_{12} &= \begin{bmatrix} 1 & \epsilon^{19} & \epsilon^{16} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{11280470} = \begin{bmatrix} 1 & 22 & 42 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{11280470} = \mathbf{Pl}(0, 42, 0, 22, 1, 0)_{15125} \\
\ell_{13} &= \begin{bmatrix} 1 & \epsilon^{33} & \epsilon^{62} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{13003124} = \begin{bmatrix} 1 & 52 & 48 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{13003124} = \mathbf{Pl}(0, 48, 0, 52, 1, 0)_{18941} \\
\ell_{14} &= \begin{bmatrix} 1 & \epsilon^{38} & \epsilon^4 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4477235} = \begin{bmatrix} 1 & 51 & 16 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4477235} = \mathbf{Pl}(0, 16, 0, 51, 1, 0)_{18782} \\
\ell_{15} &= \begin{bmatrix} 1 & \epsilon^{14} & \epsilon^{23} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{10365050} = \begin{bmatrix} 1 & 58 & 38 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{10365050} = \mathbf{Pl}(0, 38, 0, 58, 1, 0)_{19693} \\
\ell_{16} &= \begin{bmatrix} 1 & \epsilon^{49} & \epsilon^{58} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{927902} = \begin{bmatrix} 1 & 30 & 3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{927902} = \mathbf{Pl}(0, 3, 0, 30, 1, 0)_{16102} \\
\ell_{17} &= \begin{bmatrix} 1 & \epsilon^{17} & \epsilon^{62} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{13007285} = \begin{bmatrix} 1 & 53 & 48 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{13007285} = \mathbf{Pl}(0, 48, 0, 53, 1, 0)_{19068} \\
\ell_{18} &= \begin{bmatrix} 1 & \epsilon^{10} & \epsilon^{55} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{5592383} = \begin{bmatrix} 1 & 63 & 20 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{5592383} = \mathbf{Pl}(0, 20, 0, 63, 1, 0)_{20310} \\
\ell_{19} &= \begin{bmatrix} 1 & \epsilon^{13} & \epsilon^{45} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{9978077} = \begin{bmatrix} 1 & 29 & 37 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{9978077} = \mathbf{Pl}(0, 37, 0, 29, 1, 0)_{16009} \\
\ell_{20} &= \begin{bmatrix} 1 & \epsilon^{46} & \epsilon^{15} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{5775467} = \begin{bmatrix} 1 & 43 & 21 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{5775467} = \mathbf{Pl}(0, 21, 0, 43, 1, 0)_{17771} \\
\ell_{21} &= \begin{bmatrix} 1 & \epsilon^{24} & \epsilon^{47} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{14838125} = \begin{bmatrix} 1 & 45 & 55 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{14838125} = \mathbf{Pl}(0, 55, 0, 45, 1, 0)_{18059}
\end{aligned}$$

$$\begin{aligned}
\ell_{22} &= \begin{bmatrix} 1 & \epsilon^{41} & \epsilon & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{653276} = \begin{bmatrix} 1 & 28 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{653276} = \mathbf{Pl}(0, 2, 0, 28, 1, 0)_{15847} \\
\ell_{23} &= \begin{bmatrix} 1 & \epsilon^{52} & \epsilon^4 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4473074} = \begin{bmatrix} 1 & 50 & 16 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4473074} = \mathbf{Pl}(0, 16, 0, 50, 1, 0)_{18655} \\
\ell_{24} &= \begin{bmatrix} 1 & \epsilon^{21} & \epsilon^{36} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{9828281} = \begin{bmatrix} 1 & 57 & 36 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{9828281} = \mathbf{Pl}(0, 36, 0, 57, 1, 0)_{19564} \\
\ell_{25} &= \begin{bmatrix} 1 & \epsilon & \epsilon^{60} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3208130} = \begin{bmatrix} 1 & 2 & 12 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3208130} = \mathbf{Pl}(0, 12, 0, 2, 1, 0)_{12555} \\
\ell_{26} &= \begin{bmatrix} 1 & \epsilon^{50} & \epsilon^{46} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{11704892} = \begin{bmatrix} 1 & 60 & 43 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{11704892} = \mathbf{Pl}(0, 43, 0, 60, 1, 0)_{19952} \\
\ell_{27} &= \begin{bmatrix} 1 & \epsilon^{19} & \epsilon^{27} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{12345686} = \begin{bmatrix} 1 & 22 & 46 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{12345686} = \mathbf{Pl}(0, 46, 0, 22, 1, 0)_{15129} \\
\ell_{28} &= \begin{bmatrix} 1 & \epsilon^{43} & \epsilon^{51} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{6732497} = \begin{bmatrix} 1 & 17 & 25 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{6732497} = \mathbf{Pl}(0, 25, 0, 17, 1, 0)_{14473} \\
\ell_{29} &= \begin{bmatrix} 1 & \epsilon^{58} & \epsilon^{60} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3212291} = \begin{bmatrix} 1 & 3 & 12 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3212291} = \mathbf{Pl}(0, 12, 0, 3, 1, 0)_{12682} \\
\ell_{30} &= \begin{bmatrix} 1 & \epsilon^{52} & \epsilon^{54} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{2875250} = \begin{bmatrix} 1 & 50 & 10 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{2875250} = \mathbf{Pl}(0, 10, 0, 50, 1, 0)_{18649} \\
\ell_{31} &= \begin{bmatrix} 1 & \epsilon^8 & \epsilon^{39} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{2030567} = \begin{bmatrix} 1 & 39 & 7 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{2030567} = \mathbf{Pl}(0, 7, 0, 39, 1, 0)_{17249} \\
\ell_{32} &= \begin{bmatrix} 1 & \epsilon^{22} & \epsilon^{53} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1414739} = \begin{bmatrix} 1 & 19 & 5 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1414739} = \mathbf{Pl}(0, 5, 0, 19, 1, 0)_{14707} \\
\ell_{33} &= \begin{bmatrix} 1 & \epsilon^3 & \epsilon^{61} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{6428744} = \begin{bmatrix} 1 & 8 & 24 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{6428744} = \mathbf{Pl}(0, 24, 0, 8, 1, 0)_{13329} \\
\ell_{34} &= \begin{bmatrix} 1 & \epsilon^{13} & \epsilon^8 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{10510685} = \begin{bmatrix} 1 & 29 & 39 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{10510685} = \mathbf{Pl}(0, 39, 0, 29, 1, 0)_{16011} \\
\ell_{35} &= \begin{bmatrix} 1 & \epsilon^{38} & \epsilon^{32} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{7140275} = \begin{bmatrix} 1 & 51 & 26 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{7140275} = \mathbf{Pl}(0, 26, 0, 51, 1, 0)_{18792} \\
\ell_{36} &= \begin{bmatrix} 1 & \epsilon^{42} & \epsilon^{36} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{9824120} = \begin{bmatrix} 1 & 56 & 36 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{9824120} = \mathbf{Pl}(0, 36, 0, 56, 1, 0)_{19437} \\
\ell_{37} &= \begin{bmatrix} 1 & \epsilon^{34} & \epsilon^{61} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{6432905} = \begin{bmatrix} 1 & 9 & 24 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{6432905} = \mathbf{Pl}(0, 24, 0, 9, 1, 0)_{13456} \\
\ell_{38} &= \begin{bmatrix} 1 & \epsilon^{20} & \epsilon^{47} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{14833964} = \begin{bmatrix} 1 & 44 & 55 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{14833964} = \mathbf{Pl}(0, 55, 0, 44, 1, 0)_{17932} \\
\ell_{39} &= \begin{bmatrix} 1 & \epsilon^{28} & \epsilon^{46} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{11709053} = \begin{bmatrix} 1 & 61 & 43 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{11709053} = \mathbf{Pl}(0, 43, 0, 61, 1, 0)_{20079} \\
\ell_{40} &= \begin{bmatrix} 1 & \epsilon^{35} & \epsilon^{53} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1410578} = \begin{bmatrix} 1 & 18 & 5 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1410578} = \mathbf{Pl}(0, 5, 0, 18, 1, 0)_{14580} \\
\ell_{41} &= \begin{bmatrix} 1 & \epsilon^{37} & \epsilon^{29} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{7364969} = \begin{bmatrix} 1 & 41 & 27 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{7364969} = \mathbf{Pl}(0, 27, 0, 41, 1, 0)_{17523} \\
\ell_{42} &= \begin{bmatrix} 1 & \epsilon^2 & \epsilon^{57} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{13069700} = \begin{bmatrix} 1 & 4 & 49 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{13069700} = \mathbf{Pl}(0, 49, 0, 4, 1, 0)_{12846}
\end{aligned}$$

$$\begin{aligned}
\ell_{43} &= \begin{bmatrix} 1 & \epsilon^{11} & \epsilon^{58} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{932063} = \begin{bmatrix} 1 & 31 & 3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{932063} = \mathbf{Pl}(0, 3, 0, 31, 1, 0)_{16229} \\
\ell_{44} &= \begin{bmatrix} 1 & \epsilon^4 & \epsilon^{51} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{6728336} = \begin{bmatrix} 1 & 16 & 25 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{6728336} = \mathbf{Pl}(0, 25, 0, 16, 1, 0)_{14346} \\
\ell_{45} &= \begin{bmatrix} 1 & \epsilon^{52} & \epsilon^{32} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{7136114} = \begin{bmatrix} 1 & 50 & 26 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{7136114} = \mathbf{Pl}(0, 26, 0, 50, 1, 0)_{18665} \\
\ell_{46} &= \begin{bmatrix} 1 & \epsilon^{12} & \epsilon^{55} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{5588222} = \begin{bmatrix} 1 & 62 & 20 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{5588222} = \mathbf{Pl}(0, 20, 0, 62, 1, 0)_{20183} \\
\ell_{47} &= \begin{bmatrix} 1 & \epsilon^{26} & \epsilon^2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1165079} = \begin{bmatrix} 1 & 23 & 4 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1165079} = \mathbf{Pl}(0, 4, 0, 23, 1, 0)_{15214} \\
\ell_{48} &= \begin{bmatrix} 1 & \epsilon^{42} & \epsilon^{18} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3166520} = \begin{bmatrix} 1 & 56 & 11 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3166520} = \mathbf{Pl}(0, 11, 0, 56, 1, 0)_{19412} \\
\ell_{49} &= \begin{bmatrix} 1 & \epsilon^{56} & \epsilon^{29} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{7360808} = \begin{bmatrix} 1 & 40 & 27 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{7360808} = \mathbf{Pl}(0, 27, 0, 40, 1, 0)_{17396} \\
\ell_{50} &= \begin{bmatrix} 1 & \epsilon^7 & \epsilon^{43} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4676963} = \begin{bmatrix} 1 & 35 & 17 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4676963} = \mathbf{Pl}(0, 17, 0, 35, 1, 0)_{16751} \\
\ell_{51} &= \begin{bmatrix} 1 & \epsilon^5 & \epsilon^{59} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1735136} = \begin{bmatrix} 1 & 32 & 6 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1735136} = \mathbf{Pl}(0, 6, 0, 32, 1, 0)_{16359} \\
\ell_{52} &= \begin{bmatrix} 1 & \epsilon^{40} & \epsilon^{31} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3524366} = \begin{bmatrix} 1 & 14 & 13 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3524366} = \mathbf{Pl}(0, 13, 0, 14, 1, 0)_{14080} \\
\ell_{53} &= \begin{bmatrix} 1 & \epsilon^{26} & \epsilon^{27} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{12349847} = \begin{bmatrix} 1 & 23 & 46 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{12349847} = \mathbf{Pl}(0, 46, 0, 23, 1, 0)_{15256} \\
\ell_{54} &= \begin{bmatrix} 1 & \epsilon^{29} & \epsilon^{30} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{14496923} = \begin{bmatrix} 1 & 27 & 54 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{14496923} = \mathbf{Pl}(0, 54, 0, 27, 1, 0)_{15772} \\
\ell_{55} &= \begin{bmatrix} 1 & \epsilon^{42} & \epsilon^9 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{12753464} = \begin{bmatrix} 1 & 56 & 47 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{12753464} = \mathbf{Pl}(0, 47, 0, 56, 1, 0)_{19448} \\
\ell_{56} &= \begin{bmatrix} 1 & \epsilon^{41} & \epsilon^8 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{10506524} = \begin{bmatrix} 1 & 28 & 39 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{10506524} = \mathbf{Pl}(0, 39, 0, 28, 1, 0)_{15884} \\
\ell_{57} &= \begin{bmatrix} 1 & \epsilon^{19} & \epsilon^2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1160918} = \begin{bmatrix} 1 & 22 & 4 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1160918} = \mathbf{Pl}(0, 4, 0, 22, 1, 0)_{15087} \\
\ell_{58} &= \begin{bmatrix} 1 & \epsilon^{48} & \epsilon^{31} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3528527} = \begin{bmatrix} 1 & 15 & 13 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{3528527} = \mathbf{Pl}(0, 13, 0, 15, 1, 0)_{14207} \\
\ell_{59} &= \begin{bmatrix} 1 & \epsilon^{23} & \epsilon^{39} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{2026406} = \begin{bmatrix} 1 & 38 & 7 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{2026406} = \mathbf{Pl}(0, 7, 0, 38, 1, 0)_{17122} \\
\ell_{60} &= \begin{bmatrix} 1 & \epsilon^{38} & \epsilon^{54} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{2879411} = \begin{bmatrix} 1 & 51 & 10 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{2879411} = \mathbf{Pl}(0, 10, 0, 51, 1, 0)_{18776} \\
\ell_{61} &= \begin{bmatrix} 1 & \epsilon^{21} & \epsilon^9 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{12757625} = \begin{bmatrix} 1 & 57 & 47 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{12757625} = \mathbf{Pl}(0, 47, 0, 57, 1, 0)_{19575} \\
\ell_{62} &= \begin{bmatrix} 1 & \epsilon^{13} & \epsilon & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{657437} = \begin{bmatrix} 1 & 29 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{657437} = \mathbf{Pl}(0, 2, 0, 29, 1, 0)_{15974} \\
\ell_{63} &= \begin{bmatrix} 1 & \epsilon^6 & \epsilon^{59} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1739297} = \begin{bmatrix} 1 & 33 & 6 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{1739297} = \mathbf{Pl}(0, 6, 0, 33, 1, 0)_{16486}
\end{aligned}$$

$$\ell_{64} = \begin{bmatrix} 1 & \epsilon^{26} & \epsilon^{16} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{11284631} = \begin{bmatrix} 1 & 23 & 42 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{11284631} = \mathbf{PI}(0, 42, 0, 23, 1, 0)_{15252}$$

Rank of lines: ( 4160, 17043520, 8321, 270464, 274625, 5771306, 4672802, 10369211, 14492762, 9973916, 13073861, 3170681, 11280470, 13003124, 4477235, 10365050, 927902, 13007285, 5592383, 9978077, 5775467, 14838125, 653276, 4473074, 9828281, 3208130, 11704892, 12345686, 6732497, 3212291, 2875250, 2030567, 1414739, 6428744, 10510685, 7140275, 9824120, 6432905, 14833964, 11709053, 1410578, 7364969, 13069700, 932063, 6728336, 7136114, 5588222, 1165079, 3166520, 7360808, ...657437, 1739297, 11284631 )

Rank of points on Klein quadric: ( 4225, 129, 12353, 4289, 12417, 17644, 16624, 19820, 15645, 15882, 12973, 19539, 15125, 18941, 18782, 19693, 16102, 19068, 20310, 16009, 17771, 18059, 15847, 18655, 19564, 12555, 19952, 15129, 14473, 12682, 18649, 17249, 14707, 13329, 16011, 18792, 19437, 13456, 17932, 20079, 14580, 17523, 12846, 16229, 14346, 18665, 20183, 15214, 19412, 17396, ...15974, 16486, 15252 )

### 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 4160 single points:

Too many to print.

### Points on surface but on no line

The surface has 0 points not on any line:

The points on the surface but not on lines are:

## Line Intersection Graph

[illegible]

Line 0 intersects

Line 1 intersects

Line 2 intersects

Line 3 intersects

Line 4 intersects

Line 5 intersects

Line 6 intersects

Line 7 intersects

Line 8 intersects

Line 9 intersects

Line 10 intersects

Line 11 intersects

7





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Line	$\ell_0$	$\ell_1$	$\ell_2$	$\ell_3$	$\ell_4$	$\ell_5$	$\ell_6$	$\ell_7$	$\ell_8$	$\ell_9$	$\ell_{10}$	$\ell_{11}$	$\ell_{12}$	$\ell_{13}$	$\ell_{14}$	$\ell_{15}$	$\ell_{16}$	$\ell_{17}$	$\ell_{18}$	$\ell_{19}$	$\ell_{20}$	$\ell_{21}$	$\ell_{22}$	$\ell_{23}$	$\ell_{24}$	$\ell_{25}$	$\ell_{26}$	$\ell_{27}$	$\ell_{28}$	$\ell_{29}$	$\ell_{30}$	$\ell_{31}$	$\ell_{32}$	$\ell_{33}$	$\ell_{34}$	$\ell_{35}$	$\ell_{36}$	$\ell_{37}$	$\ell_{38}$	$\ell_{39}$	$\ell_{40}$	$\ell_{41}$	$\ell_{42}$	$\ell_{43}$	$\ell_{44}$	$\ell_{45}$	$\ell_{46}$	$\ell_{47}$	$\ell_{48}$	$\ell_{49}$	$\ell_{50}$	$\ell_{51}$	$\ell_{52}$	$\ell_{53}$	$\ell_{54}$	$\ell_{55}$	$\ell_{56}$	$\ell_{57}$	$\ell_{58}$	$\ell_{59}$	$\ell_{60}$	$\ell_{61}$	$\ell_{62}$	$\ell_{63}$	$\ell_{64}$	$\ell_{65}$	$\ell_{66}$	$\ell_{67}$	$\ell_{68}$	$\ell_{69}$	$\ell_{70}$	$\ell_{71}$	$\ell_{72}$	$\ell_{73}$	$\ell_{74}$	$\ell_{75}$	$\ell_{76}$	$\ell_{77}$	$\ell_{78}$	$\ell_{79}$	$\ell_{80}$	$\ell_{81}$	$\ell_{82}$	$\ell_{83}$	$\ell_{84}$	$\ell_{85}$	$\ell_{86}$	$\ell_{87}$	$\ell_{88}$	$\ell_{89}$	$\ell_{90}$	$\ell_{91}$	$\ell_{92}$	$\ell_{93}$	$\ell_{94}$	$\ell_{95}$	$\ell_{96}$	$\ell_{97}$	$\ell_{98}$	$\ell_{99}$	$\ell_{100}$	$\ell_{101}$	$\ell_{102}$	$\ell_{103}$	$\ell_{104}$	$\ell_{105}$	$\ell_{106}$	$\ell_{107}$	$\ell_{108}$	$\ell_{109}$	$\ell_{110}$	$\ell_{111}$	$\ell_{112}$	$\ell_{113}$	$\ell_{114}$	$\ell_{115}$	$\ell_{116}$	$\ell_{117}$	$\ell_{118}$	$\ell_{119}$	$\ell_{120}$	$\ell_{121}$	$\ell_{122}$	$\ell_{123}$	$\ell_{124}$	$\ell_{125}$	$\ell_{126}$	$\ell_{127}$	$\ell_{128}$	$\ell_{129}$	$\ell_{130}$	$\ell_{131}$	$\ell_{132}$	$\ell_{133}$	$\ell_{134}$	$\ell_{135}$	$\ell_{136}$	$\ell_{137}$	$\ell_{138}$	$\ell_{139}$	$\ell_{140}$	$\ell_{141}$	$\ell_{142}$	$\ell_{143}$	$\ell_{144}$	$\ell_{145}$	$\ell_{146}$	$\ell_{147}$	$\ell_{148}$	$\ell_{149}$	$\ell_{150}$	$\ell_{151}$	$\ell_{152}$	$\ell_{153}$	$\ell_{154}$	$\ell_{155}$	$\ell_{156}$	$\ell_{157}$	$\ell_{158}$	$\ell_{159}$	$\ell_{160}$	$\ell_{161}$	$\ell_{162}$	$\ell_{163}$	$\ell_{164}$	$\ell_{165}$	$\ell_{166}$	$\ell_{167}$	$\ell_{168}$	$\ell_{169}$	$\ell_{170}$	$\ell_{171}$	$\ell_{172}$	$\ell_{173}$	$\ell_{174}$	$\ell_{175}$	$\ell_{176}$	$\ell_{177}$	$\ell_{178}$	$\ell_{179}$	$\ell_{180}$	$\ell_{181}$	$\ell_{182}$	$\ell_{183}$	$\ell_{184}$	$\ell_{185}$	$\ell_{186}$	$\ell_{187}$	$\ell_{188}$	$\ell_{189}$	$\ell_{190}$	$\ell_{191}$	$\ell_{192}$	$\ell_{193}$	$\ell_{194}$	$\ell_{195}$	$\ell_{196}$	$\ell_{197}$	$\ell_{198}$	$\ell_{199}$	$\ell_{200}$	$\ell_{201}$	$\ell_{202}$	$\ell_{203}$	$\ell_{204}$	$\ell_{205}$	$\ell_{206}$	$\ell_{207}$	$\ell_{208}$	$\ell_{209}$	$\ell_{210}$	$\ell_{211}$	$\ell_{212}$	$\ell_{213}$	$\ell_{214}$	$\ell_{215}$	$\ell_{216}$	$\ell_{217}$	$\ell_{218}$	$\ell_{219}$	$\ell_{220}$	$\ell_{221}$	$\ell_{222}$	$\ell_{223}$	$\ell_{224}$	$\ell_{225}$	$\ell_{226}$	$\ell_{227}$	$\ell_{228}$	$\ell_{229}$	$\ell_{230}$	$\ell_{231}$	$\ell_{232}$	$\ell_{233}$	$\ell_{234}$	$\ell_{235}$	$\ell_{236}$	$\ell_{237}$	$\ell_{238}$	$\ell_{239}$	$\ell_{240}$	$\ell_{241}$	$\ell_{242}$	$\ell_{243}$	$\ell_{244}$	$\ell_{245}$	$\ell_{246}$	$\ell_{247}$	$\ell_{248}$	$\ell_{249}$	$\ell_{250}$	$\ell_{251}$	$\ell_{252}$	$\ell_{253}$	$\ell_{254}$	$\ell_{255}$	$\ell_{256}$	$\ell_{257}$	$\ell_{258}$	$\ell_{259}$	$\ell_{260}$	$\ell_{261}$	$\ell_{262}$	$\ell_{263}$	$\ell_{264}$	$\ell_{265}$	$\ell_{266}$	$\ell_{267}$	$\ell_{268}$	$\ell_{269}$	$\ell_{270}$	$\ell_{271}$	$\ell_{272}$	$\ell_{273}$	$\ell_{274}$	$\ell_{275}$	$\ell_{276}$	$\ell_{277}$	$\ell_{278}$	$\ell_{279}$	$\ell_{280}$	$\ell_{281}$	$\ell_{282}$	$\ell_{283}$	$\ell_{284}$	$\ell_{285}$	$\ell_{286}$	$\ell_{287}$	$\ell_{288}$	$\ell_{289}$	$\ell_{290}$	$\ell_{291}$	$\ell_{292}$	$\ell_{293}$	$\ell_{294}$	$\ell_{295}$	$\ell_{296}$	$\ell_{297}$	$\ell_{298}$	$\ell$
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Line	$\ell_0$	$\ell_1$	$\ell_2$	$\ell_3$	$\ell_4$	$\ell_5$	$\ell_6$	$\ell_7$	$\ell_8$	$\ell_9$	$\ell_{10}$	$\ell_{11}$	$\ell_{12}$	$\ell_{13}$	$\ell_{14}$	$\ell_{15}$	$\ell_{16}$	$\ell_{17}$	$\ell_{18}$	$\ell_{19}$	$\ell_{20}$	$\ell_{21}$	$\ell_{22}$	$\ell_{23}$	$\ell_{24}$	$\ell_{25}$	$\ell_{26}$	$\ell_{27}$	$\ell_{28}$	$\ell_{29}$	$\ell_{30}$	$\ell_{31}$	$\ell_{32}$	$\ell_{33}$	$\ell_{34}$	$\ell_{35}$	$\ell_{36}$	$\ell_{37}$	$\ell_{38}$	$\ell_{39}$	$\ell_{40}$	$\ell_{41}$	$\ell_{42}$	$\ell_{43}$	$\ell_{44}$	$\ell_{45}$	$\ell_{46}$	$\ell_{47}$	$\ell_{48}$	$\ell_{49}$	$\ell_{50}$	$\ell_{51}$	$\ell_{52}$	$\ell_{53}$	$\ell_{54}$	$\ell_{55}$	$\ell_{56}$	$\ell_{57}$	$\ell_{58}$	$\ell_{59}$	$\ell_{60}$	$\ell_{61}$	$\ell_{62}$	$\ell_{63}$	$\ell_{64}$	$\ell_{65}$	$\ell_{66}$	$\ell_{67}$	$\ell_{68}$	$\ell_{69}$	$\ell_{70}$	$\ell_{71}$	$\ell_{72}$	$\ell_{73}$	$\ell_{74}$	$\ell_{75}$	$\ell_{76}$	$\ell_{77}$	$\ell_{78}$	$\ell_{79}$	$\ell_{80}$	$\ell_{81}$	$\ell_{82}$	$\ell_{83}$	$\ell_{84}$	$\ell_{85}$	$\ell_{86}$	$\ell_{87}$	$\ell_{88}$	$\ell_{89}$	$\ell_{90}$	$\ell_{91}$	$\ell_{92}$	$\ell_{93}$	$\ell_{94}$	$\ell_{95}$	$\ell_{96}$	$\ell_{97}$	$\ell_{98}$	$\ell_{99}$	$\ell_{100}$	$\ell_{101}$	$\ell_{102}$	$\ell_{103}$	$\ell_{104}$	$\ell_{105}$	$\ell_{106}$	$\ell_{107}$	$\ell_{108}$	$\ell_{109}$	$\ell_{110}$	$\ell_{111}$	$\ell_{112}$	$\ell_{113}$	$\ell_{114}$	$\ell_{115}$	$\ell_{116}$	$\ell_{117}$	$\ell_{118}$	$\ell_{119}$	$\ell_{120}$	$\ell_{121}$	$\ell_{122}$	$\ell_{123}$	$\ell_{124}$	$\ell_{125}$	$\ell_{126}$	$\ell_{127}$	$\ell_{128}$	$\ell_{129}$	$\ell_{130}$	$\ell_{131}$	$\ell_{132}$	$\ell_{133}$	$\ell_{134}$	$\ell_{135}$	$\ell_{136}$	$\ell_{137}$	$\ell_{138}$	$\ell_{139}$	$\ell_{140}$	$\ell_{141}$	$\ell_{142}$	$\ell_{143}$	$\ell_{144}$	$\ell_{145}$	$\ell_{146}$	$\ell_{147}$	$\ell_{148}$	$\ell_{149}$	$\ell_{150}$	$\ell_{151}$	$\ell_{152}$	$\ell_{153}$	$\ell_{154}$	$\ell_{155}$	$\ell_{156}$	$\ell_{157}$	$\ell_{158}$	$\ell_{159}$	$\ell_{160}$	$\ell_{161}$	$\ell_{162}$	$\ell_{163}$	$\ell_{164}$	$\ell_{165}$	$\ell_{166}$	$\ell_{167}$	$\ell_{168}$	$\ell_{169}$	$\ell_{170}$	$\ell_{171}$	$\ell_{172}$	$\ell_{173}$	$\ell_{174}$	$\ell_{175}$	$\ell_{176}$	$\ell_{177}$	$\ell_{178}$	$\ell_{179}$	$\ell_{180}$	$\ell_{181}$	$\ell_{182}$	$\ell_{183}$	$\ell_{184}$	$\ell_{185}$	$\ell_{186}$	$\ell_{187}$	$\ell_{188}$	$\ell_{189}$	$\ell_{190}$	$\ell_{191}$	$\ell_{192}$	$\ell_{193}$	$\ell_{194}$	$\ell_{195}$	$\ell_{196}$	$\ell_{197}$	$\ell_{198}$	$\ell_{199}$	$\ell_{200}$	$\ell_{201}$	$\ell_{202}$	$\ell_{203}$	$\ell_{204}$	$\ell_{205}$	$\ell_{206}$	$\ell_{207}$	$\ell_{208}$	$\ell_{209}$	$\ell_{210}$	$\ell_{211}$	$\ell_{212}$	$\ell_{213}$	$\ell_{214}$	$\ell_{215}$	$\ell_{216}$	$\ell_{217}$	$\ell_{218}$	$\ell_{219}$	$\ell_{220}$	$\ell_{221}$	$\ell_{222}$	$\ell_{223}$	$\ell_{224}$	$\ell_{225}$	$\ell_{226}$	$\ell_{227}$	$\ell_{228}$	$\ell_{229}$	$\ell_{230}$	$\ell_{231}$	$\ell_{232}$	$\ell_{233}$	$\ell_{234}$	$\ell_{235}$	$\ell_{236}$	$\ell_{237}$	$\ell_{238}$	$\ell_{239}$	$\ell_{240}$	$\ell_{241}$	$\ell_{242}$	$\ell_{243}$	$\ell_{244}$	$\ell_{245}$	$\ell_{246}$	$\ell_{247}$	$\ell_{248}$	$\ell_{249}$	$\ell_{250}$	$\ell_{251}$	$\ell_{252}$	$\ell_{253}$	$\ell_{254}$	$\ell_{255}$	$\ell_{256}$	$\ell_{257}$	$\ell_{258}$	$\ell_{259}$	$\ell_{260}$	$\ell_{261}$	$\ell_{262}$	$\ell_{263}$	$\ell_{264}$	$\ell_{265}$	$\ell_{266}$	$\ell_{267}$	$\ell_{268}$	$\ell_{269}$	$\ell_{270}$	$\ell_{271}$	$\ell_{272}$	$\ell_{273}$	$\ell_{274}$	$\ell_{275}$	$\ell_{276}$	$\ell_{277}$	$\ell_{278}$	$\ell_{279}$	$\ell_{280}$	$\ell_{281}$	$\ell_{282}$	$\ell_{283}$	$\ell_{284}$	$\ell_{285}$	$\ell_{286}$	$\ell_{287}$	$\ell_{288}$	$\ell_{289}$	$\ell_{290}$	$\ell_{291}$	$\ell_{292}$	$\ell_{293}$	$\ell_{294}$	$\ell_{295}$	$\ell_{296}$	$\ell_{297}$	$\ell_{298}$	$\ell$
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Line 64 intersects

Line	$\ell_0$	$\ell_1$	$\ell_2$	$\ell_3$	$\ell_4$	$\ell_5$	$\ell_6$	$\ell_7$	$\ell_8$	$\ell_9$	$\ell_{10}$	$\ell_{11}$	$\ell_{12}$	$\ell_{13}$	$\ell_{14}$	$\ell_{15}$	$\ell_{16}$	$\ell_{17}$	$\ell_{18}$	$\ell_{19}$	$\ell_{20}$	$\ell_{21}$	$\ell_{22}$
in point	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$	$P_3$

The surface has 4161 points:  
Too many to print.