$$\Rightarrow \left| Q^{-1}\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} + \lambda I \right|$$

$$= \left| \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} + \lambda \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right|$$

$$= \left| \begin{pmatrix} a_{11}, & 0. & 0 \\ a_{21}, & 0. & 0 \\ a_{31}, & 0. & 0 \end{pmatrix} + \begin{pmatrix} \lambda & 0 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{pmatrix} \right| = \left| \begin{pmatrix} \lambda + a_{11}, & 0. & 0 \\ a_{21}, & \lambda & 0 \\ a_{31} & 0 & \lambda \end{pmatrix} \right|$$

$= \lambda^2(\lambda + a_{11}) = 0 \Rightarrow \lambda = 0$ is a double root & $\lambda = -a_{11}$

At $\lambda = 0$ & $-a_{11}$, L has singular points. i.e singular conic. $\Rightarrow$ At $\lambda = 0$, i.e. F, $m_F(L, W_1) = 2$ since $\lambda = 0$ is a double root. At $\lambda = -a_{11}$, L has a singular cubic. By the argument above, L is the set of all conics passing p & p' and tangent to G at those two points, and if we let l & l' be the tangent lines of G at p & p' respectively, then $l + l'$ is a conic passing p & p', and tangent to G at those two points. $\Rightarrow$ $l + l' \in L$ $\Rightarrow$ $l + l'$ is the only singular conic in L other than F.

$\lrcorner$

The reader may check that the tangent space