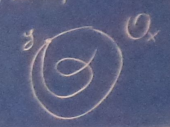


$\dim_k(\mathcal{O}_p/\mathfrak{m}_p^n) = \dim_k(\mathcal{O}_p/\mathfrak{m}_p) + \dots$
 ...
 $\dim_k(\mathcal{O}_p/\mathfrak{m}_p) = 1$

Cal(1) $\mathcal{O}_p \subset X$
 $\mathcal{O}_p = \mathcal{O}_p$
 ...
 ...

Given \mathcal{O}_p
 $\mathcal{O}_p = \mathcal{O}_p$
 $\mathcal{O}_p = \mathcal{O}_p$
 Def \mathcal{O}_p is a localization
 of \mathcal{O}_p if $\dim_k(\mathcal{O}_p) = \dim_k(\mathcal{O}_p)$
 $\mathcal{O}_p = \mathcal{O}_p$

How to describe the set \mathcal{O}_p ?
 Theorem (Crawford, O'Neil, '80) Let X be an affine variety
 and G an affine algebraic group acting on X . Let $x, y \in X$
 $\mathcal{O}_y \in \mathcal{O}_x \iff$ There exists a k -derivate R such that
 (i) $\frac{y}{x}$ is a k -valued valuation algebra
 (ii) $L = \text{Frac}(R) \rightarrow$ finally you end of trace degree
 λ is k -free as R -module
 There exists $\lambda \in X(R)$ such that
 (i) $\mathcal{O}_x = \mathcal{O}_y$ in $X(\lambda) \rightarrow X(R) \rightarrow X(\frac{R}{\mathfrak{m}}) = X(k)$
 (ii) $\mathcal{O}_x = \mathcal{O}_y$ in $X(L)$
 $\lambda \otimes L = \lambda \otimes R$



...
 ...
 ...

Let λ be such a k -free algebra
 ...
 ...
 ...

$R = k\langle g \rangle$ generated by
 f, t, c, p^*, p_* in $R[[t]]$
 where $\frac{f}{t} = \sum_{i=0}^{\infty} f_i t^i, f_i \in R$
 $\frac{f}{t} = 0$
 $R \in R[[t]], \lambda$ is a R -algebra
 $\mathfrak{q} = R \cap \text{Ker}(R[[t]] \xrightarrow{\lambda} R)$

There is a prime ideal \mathfrak{P}



L is unimodular $\iff \dim L = 3$
 1) the degree number of L
 $(L) = \frac{1}{2}(\dim L + 1)$
 $(L) = 2 \iff \dim L = 3$ is a local no body of L
 2) L is called irregular
 if $\forall f \in L$ a polynomial over L

Thm (Van der Borch) Assume L has no proper S_L and that $\forall f \in L$ is fully generated by two homogeneous elements $f_1, f_2 \in S(L)$. Then we have

$$\sum_{i=1}^2 \deg f_i = (L) - \deg L$$

Prop Suppose L has no proper S_L with $\dim L \neq 3$. If L is irregular then
 (1) $3 \cdot (L) + 2 \deg L \leq \dim L + 2 \dim S(L)$ (ineq)
 (2) $\text{codim } L_S^* \leq 3$ (Tot 2)
Cor Let L be simple and let V be an irreducible L -module. If $S(V)$ is polynomial then $\dim V \leq 2 \dim L$.

Thm Let L be unimodular having an ideal H of codim 1. Then the following are true:
 1) L is irregular and algebraic
 2) L is irregular $\iff \text{hdeg } \gamma(L) = (L)$
 3) $\dim(L, L) \leq 2$

$\dim(L) = \dim \text{vec } L$
 $\iff \dim L = 3$ with weight $\neq 0$
 $\iff \dim L = 3$ with weight $\neq 0$
 $\iff \dim L = 3$ with weight $\neq 0$

Cor Suppose L has no proper S_L .
 Then (a) $S_L(L) = Y(L)$
 (b) $R(L) = O(Y(L))$
 (c) L is unimodular ($\text{tr}(\text{ad } x) = 0 \forall x \in L$)

$$\Lambda(L) = \{ \alpha \in L^* \mid S(L)_\alpha \neq 0 \}$$

$$L_\Lambda = \bigcap_{\alpha \in \Lambda(L)} \ker \alpha$$
 char. ideal of L .
 truncation of L .

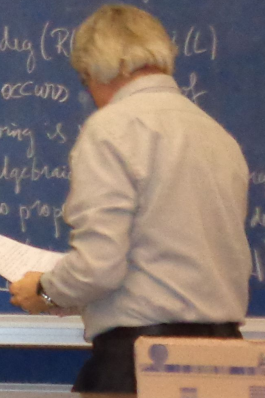
Thm 1) L_Λ has no proper S_L
 2) $Y(L) \subset S_Y(L) \subset Y(L_\Lambda) \neq S_Y(L)$
 $= \{ f \mid f \text{ is algebraic or } f \text{ is Frobenius} \}$
 $f \in L^* \implies L(f) = \{ \alpha \in L \mid f([x, y]) = 0 \forall x, y \in L \}$

$$i(L) = \min_{f \in L^*} \dim L(f) = \frac{\dim L}{n} - \text{rank} \begin{pmatrix} [x_i, x_j] \\ R(L) \end{pmatrix}$$

f is called regular $\dim L(f) = \dim L$
 $L_{\text{reg}}^* = L^* \setminus L_{\text{alg}}^*$

Thm: $\text{hdeg}(R(L)) = i(L)$
 Equality occurs iff the following is true:
 (1) L is algebraic
 (2) L has no proper S_L

$$i(L) = \text{hdeg}(R(L)) = i(L)$$



$\dim H_0 = 1$
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 $\dim H_2 = 1$
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 $\dim H_{100} = 1$

There are $\frac{d_i}{2} + 1$ pairs if ψ_i is not surjective.
 Example: There is also a \mathbb{Z}^2 if $\sigma(H_i) = \pm H_i \forall i$
 Springer: $\sigma(H_i) = -H_i = rKy - rKy_0$
 How many generators are in \mathbb{Z}^2 ?
 $H_1 \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $H_2 \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ $H_3 \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_4 \begin{pmatrix} 1 \\ 0 \end{pmatrix}$
 $H_5 \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_6 \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $H_7 \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_8 \begin{pmatrix} 1 \\ 0 \end{pmatrix}$
 $H_9 \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_{10} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $H_{11} \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_{12} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$
 $H_{13} \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_{14} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $H_{15} \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_{16} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$
 $H_{17} \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_{18} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $H_{19} \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $H_{20} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$
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$$\sum_{d_i \text{ even}} \left(\frac{d_i}{2} + 1 \right) + \sum_{d_i \text{ odd}} \frac{d_i + 1}{2} = \frac{1}{2} \left(\sum_{i=1}^l d_i + 2rKy_0 + (rKy - rKy_0) \right) = \frac{1}{2} (\dim g_{\mathbb{Z}} + rKy - rKy_0)$$

Then if there is a \mathbb{Z}^2 for σ , then \mathbb{Z} is a free algebra

TCG $R_{k'}(T) \subseteq R_{k'}(T') = G$
 $C \times G \xrightarrow{\text{dual}} R_{k'}(T) \rightarrow R_{k'}(T')$
 $\xrightarrow{R_{k'}(T)}$
 $\xrightarrow{R_{k'}(T')}$

Example: Suppose k' is a finite extension of k of degree $k'/k = p$
 let $G = \text{Norm}$ the multiplicative group over k
 $\& G = R_{k/k}(G')$

B has nilpotent \dots
 So $u = 1+n$ is unipotent $\& n^p = 0$
 In fact: G has $(p-1)$ -dim unipotent radical

Next case $k = \bar{k}$, factor out $R_u(G)$
 because it acts trivially in any simple rep
 & consider reductive groups
 G reductive TCB CG

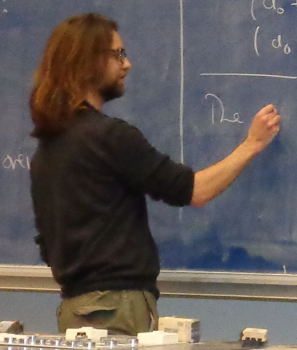
General k
 Best we can do is factor out $R_{u,k}(G)$
 giving a pseudo-reductive group \uparrow
 k -unip radical
 Tits \rightsquigarrow Conrad-Gabber-Prasad \rightarrow Classification

Obtain a k -group G
 $G(A) = G'(A)$
 for k -alg A
 CGP \Rightarrow "all pseudo"

G contains a copy of Norm
 & G has "natural module":
 $G' \subset G \subset A^1$
 \downarrow
 $G \subset G \subset p$ -dim space

Eg $p=2$, k' has k -basis $\{1, t\}$
 $(a_0 + a_1 t)(1) = a_0 + a_1 t$
 $(a_0 + a_1 t)(t) = a_1 t^2 + a_0 t$
 $\rightsquigarrow \begin{pmatrix} a_0 & a_1 t^2 \\ a_1 & a_0 \end{pmatrix}$
 $\subseteq GL_2(A)$
 k -alg A

I.e. for a k -alg A , $G(A)$
 A module for G over k
 V (viewed as a functor by
 with nat. trans $G \times V \rightsquigarrow$
 such that $G(A) \times V(A)$



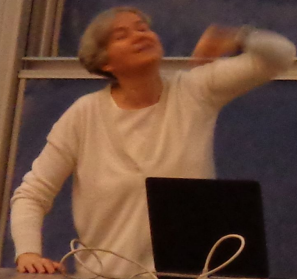
BOULDER CAMPUS

Upper triangular form of SE_B and SN_B

Example ($B = (4, 3^2, 2, 1)$)

With respect to $\Delta_{B, \leftarrow}$ a generic element of SN_B is

| | | | | | | | | | | | | |
|---|---|---|----------|-----------|---|--------|--------|----------|----------|---------|--------|----------|
| 0 | v | p | α | λ | a | z | q | β | b | w | r | c |
| 0 | 0 | d | ξ | θ | j | g | e | ζ | y | h | f | k |
| | | 0 | ρ | π | s | m | i | σ | δ | n | l | u |
| | | | 0 | ϕ | 0 | τ | η | χ | 0 | ι | ψ | ω |
| | | | | | 0 | v | p | α | a | z | q | b |
| | | | | | 0 | 0 | d | ξ | j | g | e | y |
| | | | | | | | 0 | ρ | s | m | i | t |
| | | | | | | | | 0 | 0 | τ | η | δ |
| | | | | | | | | | 0 | v | p | a |
| | | | | | | | | | | 0 | d | j |
| | | | | | | | | | | | 0 | s |
| | | | | | | | | | | | | 0 |



BONDE TUU CAMPUS

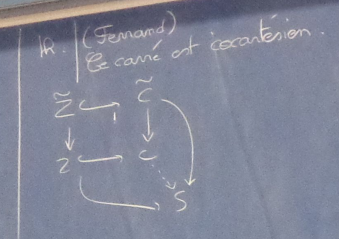
Soit C une courbe lisse sur un corps k .
 Soit $\gamma \in \pi_1(C, x)$ un élément de son groupe fondamental.
 Soit X une courbe de genre g sur k .
 Soit $\tilde{X} \rightarrow X$ une revêtement galoisien de degré n .
 Soit $\tilde{\gamma} \in \pi_1(\tilde{X}, \tilde{x})$ un élément de son groupe fondamental.
 Soit $\tilde{C} \rightarrow C$ une courbe telle que $\tilde{C} \times_C \tilde{X} \cong \tilde{X}$.
 Soit $\tilde{\gamma} \in \pi_1(\tilde{C}, \tilde{x})$ un élément de son groupe fondamental.
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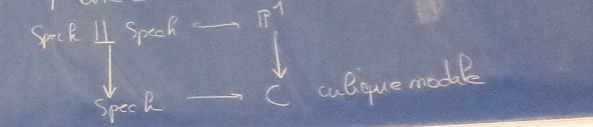
Aut $\mathbb{C} \cong \text{Aut}(k)$ est algébrique.
 Soit C une courbe projective. $AB = E$ (endomorphisme).
 Soit $\tilde{C} \rightarrow C$ une courbe telle que $\tilde{C} \times_C \tilde{X} \cong \tilde{X}$.
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(Ferreol)
 Soit \tilde{Z} une courbe, $\tilde{Z} \rightarrow \tilde{Z}$ l'identité.
 Il existe une unique courbe C telle que $\tilde{Z} \times_C \tilde{Z} \cong \tilde{Z}$.
 Soit \tilde{C} est rég, alors γ est la normalisation.
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Soit C une courbe lisse sur un corps k .
 Soit $\tilde{C} \rightarrow C$ une courbe telle que $\tilde{C} \times_C \tilde{X} \cong \tilde{X}$.
 Soit $\tilde{\gamma} \in \pi_1(\tilde{C}, \tilde{x})$ un élément de son groupe fondamental.
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