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# Algebraic Topology Variations of Prime Order Automorphisms with Applications

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**Annotation:**
Simple polarized abelian kinds of odd integer dimensions have cyclic automorphism groups across Galois field. To create completely simple polarized algebraic variations of prime dimensions across finite fields, with a cyclic group of maximal order as their automorphism group.In this work, we focus on polarized Abelian types with an automorphism of prime order s>2. Convincedusual requirements on the algebraic expressions of its action on first-order differentials imply that such polarized varieties aren't Jacobians of curvatures.There has been a lot of effort put into estimating the size of automorphism groups of broad categories. The latest articles, as well as the references they include, give a wealth of information on this subject..

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## 1. Introduction

The thing we're interested in is looking at the prime number distributions, which can be represented as a property of the basis area of certain completely simple algebraic variety in our design. Let G be a related simple Lie group with the Lie algebra $L$ as the appropriate Lie lattice. Let $L'$ be a maximum regular semi simple Lie subalgebra of $L$ having subgroup $G'$ as the corresponding subgroup. The centralizer of $G'$ in $G$ and its influence on the forms of the Lie algebra $L$ are the subjects of this work. These centralizers are abelian subgroup of $G$ in general. In the abelian group [1] provided the first precise account of continuously centralizers, wherever they exist, whereas [2] provided the first precise account of discrete centralizers [15-29].

Suppose $n \geq 1$is an absolute value and $(Z, \partial)$ a primarily polarized$n$ −dimensional abelian variety over the complex number $\mathbb{C}$, $\alpha$an automorphism of $(Z, \partial)$ that fulfills the cyclotomic expression $\sum_{j=0}^{s-1} \alpha^j = 0$ in End $Z$. In other terms,$\alpha$ is a regular automorphism with order $s$ with a limited set of established positions. This results in embeds [30-45].

$$\mathbb{Z}[\omega_s] \mapsto End(Z), 1 \mapsto 1_Z, \omega_s \mapsto \alpha,$$
$$\mathbb{Q}(\omega_s) \mapsto End^0(Z), 1 \mapsto 1_Z, \omega_s \mapsto \alpha.$$

We describe some mathematical notations which is used above, such as $\mathbb{C}$is denoted by complex numbers,$\mathbb{R}$is denoted byfield of a real number [46-77]. The field of rational numbers is represented by$\mathbb{Q}$, and $\mathbb{Z}_+$ is represented by the set of nonnegative integers while $\mathbb{Z}$ is the ring of integers. The following relationship of these numbers are well known in the literature [78-101].

$$\mathbb{Z}_+ \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C}$$

For cardinality of $B$, we write $\#(B)$ if $B$ is finite or maybe an empty set. Suppose $s$ be an odd prime and $\omega_s \in \mathbb{C}$ to be the primitive (complex) $s$th root of unity. For the $s$th cyclotomic ring and the $s$th cyclotomic field, we write $\mathbb{Z}[\omega_s]$ and $\mathbb{Q}(\omega_s)$ respectively. It forms the cyclic group $\mu_s$ of $p^{th}$ roots of unity of multiplicative order $s$.We have$\omega_s \in \mu_s \subset \mathbb{Z}[\omega_s] \subset \mathbb{Q}(\omega_s) \subset \mathbb{C}$.

Since the degree $[\mathbb{Q}(\omega_s) : \mathbb{Q}]$ is $s-1$, it follows$(s-1)|2n$. The $n-$dimensional complex vector space $\aleph^1(Z)$ is operates on$\mathbb{Q}(\omega_s)$of variances of the first form on $Z$ through functionality. The condition described in [9,10].

This gives $\aleph^1(Z)$ the structure of $\mathbb{Q}(\omega_s) \otimes_{\mathbb{Q}} \mathbb{C}-$module. Obviously,

$$\mathbb{Q}(\omega_s) \otimes_{\mathbb{Q}} \mathbb{C} = \oplus_{j=1}^{s-1} \mathbb{C}$$

And the $j$th summand relates to the $\mathbb{Q}(\omega_s) \mapsto \mathbb{C}$ field embed those transfers $\omega_s$ to $\omega_s^j$. As a result, $\mathbb{Q}(\omega_s)$ operates on $\aleph^1(Z)$ with multiplicities $c_j(j = 1, \dots s-1)$. All $c_j$ are non-negative integers and$\sum_{j=1}^{s-1} c_j = n$.

**2. Principally polarized abelian varieties with automorphisms:**

The fundamental findings are extended to mostly polarized abelian variants in this section. Direct approaches are almost certainly capable of improving real estimations [102-134]. A recent Feat finding, according to an argument of this rule, can be utilized to produce much developing work in characteristic 0. However, in the case of a good trait, such reasoning does not hold water [135-161].

In calculation,

$$c_j + c_{s-j} = \frac{2n}{s-1}\text{forall}j = 1, \dots s-1; \quad (1)$$

In general, this is a special case of a well-known outcome about endomorphism fields of complex abelian varieties [6].

On the finite cyclic group $G = (\mathbb{Z}/s\mathbb{Z})^*$ of order $(s-1)$, We may view $\{c\}$ as a nonnegative integer-valued function $c = c_Z$,were

$$c(j \bmod s) = c_j(1 \le j \le s-1), \sum_{h \in G} c(h) = n. \quad (2)$$

The identity element 1 $mod\, s$ and the only element $(-1)mod\, s = (s-1)mod\, s$ of order 2 are two distinguished elements contains in group $G$. We write $-h$ for the product $(-1)mod\, s \cdot h$ in $G$, if $h$ is an element of $G$. If $h = jmod\, s$ then $-h = (s-j)mod\, s$. In light of (1),

$$c_Z(h) + c_Z(-h) = \frac{2n}{s-1}\text{forall}h \in G. \quad (3)$$

**Definition 2.1.**Suppose a nonnegative integer-valued function to be$l : G \to \mathbb{Z}_+$. Then we

say that $l$ is admissible if

$$c(h) + c(-h) = \frac{2n}{s-1} \forall h \in G.$$

The following ways is satisfied the above result

(i) In light of (3), our $c = c_Z$ is admissible.

(ii) The number of admissible functions (forgiven $n$ and $p$) is obviously

$$\left(\frac{2n}{s-1}+1\right)^{(s-1)/2}$$

**Example 2.2.** Assume that$s=3$ and $E$ be an elliptical curvature concluded$\mathbb{C}$ multiplied by $\mathbb{Z}[\omega_3]$. We may take as $E$ the smooth projective model of $x^2=z^3-1$ where $\gamma_3$ acts on $E$ by

$\alpha_E\colon (z,x)\mapsto(z,\gamma_3 x)$.

Clearly, $\alpha_E$ satisfies the 3rd cyclotomic equation and respects the only principal polarization on $E$.

Let $l(1)$ and $l(-1)$be nonnegative integers and $n$ be a positive integer, whose sum is $n$. Let us put

$$X_1=E^{l(1)},X_2=E^{l(2)},X=X_1\times X_2.$$

Let the principal polarization on $X$is $\partial_X$ that is the product of $n$ pull-backs of the polarization on $E$. Let us consider the automorphism $\alpha_3$ of $X$that act (diagonally) as $\alpha_E$ on $X_1=E^{l(1)}$ and as $\alpha_E^{-1}$ on $X_2=E^{l(2)}$. Clearly, $\alpha_3$ satisfies the 3rd cyclotomic equation and respects $\partial_X$. It is also clear that

$c_X(1)=l(1),c_X(1)=l(2)$.

We will also need the function

$$j\colon G=(\mathbb{Z}/s\mathbb{Z})^*\to\mathbb{Z}),(j\ mod\ s)\mapsto j(1\le j\le s-1) \qquad (4)$$

Clearly,

$$j(h_1h_2)\equiv j(h_1)j(h_2)\ mod\ s\ \forall h_1,h_2\in G \qquad (5)$$

Recall that if $l_1(h)$ and $l_2(h)$are composite-valued functions on $G$ there fore its convolution is the function $l_1*l_2(h)$on $G$ defined by

$$l_1*l_2(h)=\frac{1}{s-1}\sum_{u\in G}l_1(u)l_2(u^{-1}h) \qquad (6)$$

**Theorem 2.3.** Assume that $(Z,\partial)$ is the Jacobian of a smoothly complex type $n$curvature$C$ with canonical primary polarisation. Then there will be a function with a positive integer value.

$$d\colon G=(\mathbb{Z}/s\mathbb{Z})^*\to\mathbb{Z}_+\subset\mathbb{C}$$

such that

$$\sum_{h\in G}d(h)=\frac{2n}{s-1}+2, \qquad (7)$$

$$c(v)=\frac{(s-1)}{s}\cdot d*j(-v)-1\forall v\in G. \qquad (8)$$

Proof. Assume $(Z,\partial)\cong(J(C),\Theta)$ where $J(C)$ is a Jacobian with standard primary polarization $\Theta$ and $C$ is an irreducible smoothness spatial dimension $n$curvature. The Torelli theorem in Weil's way [11,12,14] implies the existence of an automorphism: $\beta\colon C\to C$, which by functionality induces either or$\alpha$ or $-\alpha$ on $J(C)=Z$.We can and shall assume that induces by replacing $\beta$ by $\beta^{s+1}$ and keeping in mind that $(s+1)$ is even and $\alpha^s$ is an automorphism that is the identity of $Z=J(C)$. $\beta$ induces $\alpha$ is the identity and $\beta^s$an automorphism of $C$ since it produces the identical map on $J(C)$ and $n>1$. The operation of $\beta$ on $C$ results in group insertion [162-175].

$$\mu_s\mapsto Aut(C),\omega_s\mapsto\beta.$$

Assume $P \in C$ is a constant value of $\beta$. The $\beta$ automorphism of the appropriate one-dimensional curvature interplanetary$T_P^{\gamma}(C)$ is then induced, which is multiplied by a complex number $\varepsilon_P$. $\varepsilon_P$ is a $s$th root of unity [176-190].

**Corollary 2.4.**The smooth projective irreducible curvature is the quotient $D := C/\mu_s$. The degree of the map $C \to D$ is $s$, its implications vertices are precise duplicates of point sets of $\beta$, and all implications indicators are $s$.

**Lemma 2.5.**The projective line is biregularly isomorphic to $D$.

The proof of the above lemma 2.5 Albanese functorially, the map $C \to D$ generates the surjective homomorphism of the respective jacobians $J(C) \to J(D)$, which slays the factors modules of the type $(Q) - (\beta(Q))$ for each $Q \in C(\mathbb{C})$. This means that it is lethal to $(1-\alpha)J(C)$, on either side,$1-\alpha : J(C) \to J(C)$ is an isogeny. This suggests that the duplicate of $J(C)$ in $J(D)$ is zero, and thus $J(D) = 0$ due to surjectiveness. This suggests that D's genus is zero.

**Corollary2.6.**The fixed points of $\beta$ for the number $F(\beta)$ is $\frac{2n}{s-1} + 2$.

Proof: Applying the Riemann-Hurwitz's formula for proof of the above Corollary to $C \to D$, we get

$$2n - 2 = s \cdot (-2) + (s-1) \cdot F(\beta)$$

**Corollary2.7.**Let $\beta^*: \aleph^1(C) \to \aleph^1(C)$ be the automorphism of the $g$-dimensional complex vector space $\aleph^1(\mathrm{C})$ induced by $\beta$ and $\tau$ the trace of $\beta^*$. Then

$$\tau = \sum_{j=1}^{s-1} c_j \, \omega_s^j = \sum_{h \in G} c\,(h)\omega_s^h.$$

Proof of the above Corollaryconsider the regular map $s$ andpick a $\beta$-invariant point $P_0$

$\psi: C \to J(C), Q \mapsto a((Q) - (P_0))$.

The complex vector spaces is well-known that $\psi$ inducesan isomorphism.

$$\psi^*: \aleph^1(J(C)) \cong \aleph^1(C)$$

Obviously,

$$\beta^* = \psi^* \alpha^* \psi^{*-1}$$

where $\alpha^*: \aleph^1(J(C)) = \aleph^1(J(C))$ denotes the $\mathbb{C}-$linear automorphism generated by$\alpha$. This means that the traces of $\beta^*$ and $\alpha^*$ do correspond. The definition of a $c_j$ now entails that the trace of $\beta^*$ equals $\sum_{j=1}^{s-1} c_j \, \omega_s^j$.

**Lemma 2.8.**Suppose a primitive sth root of unity is $\omega \in \mathbb{C}$. Then

$$\frac{1}{1-\omega} = -\frac{\sum_{j=1}^{s-1} j\omega^j}{s} = -\frac{\sum_{h \in G} j(h)\omega^h}{s}. \qquad (9)$$

*Proof*. We have

$$(1-\omega)\left(\sum_{j=1}^{s-1} j\,\omega^j\right) = \sum_{j=1}^{s-1}(j\omega^j - j\omega^{j+1}) = \left(\sum_{j=1}^{s-1} \omega^j\right) - (s-1)\omega^s = (-1) - (s-1) = -s.$$

Ending the Theorem 1.4 proofs: Let $B$ denote the collection of specified points of $\beta$. We already know that $\#(B) = \frac{2n}{s-1} + 2$. By using the holomorphic Lefschetz convergence point equations [1,2,5] to $\beta$,

$$1 - \bar{\tau} = \sum_{P \in B} \frac{1}{1-\varepsilon_P} \quad (10)$$

where $\bar{\tau}$ is the complexconjugate of $\tau$. Recall that every $\varepsilon_P$ is $c$ (primitive) $p^{th}$ root of unity. Now Theorem 1.4 follows readily from the following assertion.

**Lemma2.9.**Let us define for each$h \in G$the nonnegative integer$d(h)$as the number of fixed points$P \in B \subset C(\mathbb{C})$such that$\varepsilon_P = \omega_s^h$. Then

$$\sum_{h \in G} d\,(h) = F(\beta) = \frac{2n}{s-1} + 2. \quad (11)$$

and

$$c(v) = \frac{(s-1)}{s} \cdot d * j(-v) - 1 \forall v \in G. \quad (12)$$

Proof: The equality (11)is obvious to prove Lemma2.9. Let us prove (12). Combining (10) with Lemma 2.8 (applied to $\omega = \omega_s^h$) and Corollary2.7 we get

$$1 - \sum_{h \in G} c\,(h)\omega_s^{-h} = \sum_{u \in G} d\,(u) \frac{1}{1-\omega_s^u} = \frac{-1}{s}\left(\sum_{u \in G} d\,(u)\left(\sum_{h \in G} j\,(h)\omega_s^{hu}\right)\right)$$

$$= \frac{-1}{s}\sum_{v \in G}\left(\sum_{u \in G} d\,(u) j(u^{-1}v)\right)\omega_s^v = \frac{-1}{s}\sum_{v \in G} d * j(v)\omega_s^v$$

(here we use a substitution $v = hu$). Taking into account that

$$0 = 1 + \sum_{j=1}^{s-1} \omega_s^j = 1 + \sum_{v \in G} \omega_s^v,$$

we obtain

$$-\left(\sum_{v \in G} \omega_s^v\right) - \sum_{h \in G} c\,(h)\omega_s^{-h} = -\frac{(s-1)}{s}\sum_{v \in G} d * j(v)\omega_s^v.$$

Taking into account that the $(s-1)$-element set

$$\{\omega_s^j | 1 \le j \le s-1\} = \{\omega_s^v | v \in G\}$$

we get $1 + c(-v) = (s-1)d * j(v)/s$, i.e.,

$$c(v) = \frac{(s-1)}{s} \cdot d * j(-v) - 1 \forall v \in G.$$

**Remark 2.10.** Let us consider the function

$$j_0 = j - \frac{s}{2} : G = (\mathbb{Z}/s\mathbb{Z})^* \to \mathbb{Q}, (j mod\ s) \mapsto j - \frac{s}{2} \text{ where } j = 1, \dots, s-1 \quad (13)$$

Then

$$j_0(-u) = -j_0(u) \forall u \in G. \quad (14)$$

We have

$d * j(v) = d * j_0(v) + \frac{s}{2(s-1)}\sum_{h\in G} d\,(h) = d * j_0(v) + \frac{s}{2(s-1)}\left(\frac{2n}{s-1} + 2\right)$. This implies that

$$\frac{(s-1)}{s} \cdot d * j(v) = \frac{(s-1)}{s} \cdot d * j_0(v) + \frac{n}{s-1} + 1$$

and therefore

$c(v) = \frac{(s-1)}{s} \cdot d * j_0(-v) + \frac{n}{s-1} \forall v \in G.$ (15)

On the other hand, it follows from (14)that the convolution $d * j_0$ also satisfies

$$d * j_0(-v) = d * j_0(v) \forall v \in G.$$

This implies that

$c(v) + c(-v) = \frac{(s-1)}{s} \cdot d * j_0(-v) + \frac{n}{s-1} + \frac{(s-1)}{s} \cdot d * j_0(v) + \frac{n}{s-1} = \frac{2n}{s-1} \forall v \in G$. This implies that

$c(v) + c(-v) = \frac{2n}{s-1}$ (16)

(Actually, we already know it see (1). It follows from (16) that

$c(v) = \frac{2n}{s-1} - \frac{(s-1)}{s} \cdot d * j(v) + 1 \forall v \in G$ (17)

**Corollary 2.11.**We preserve Theorem 14's terminology and assumptions.$d^{'}: G \to \mathbb{C}$be a complex-valued function on$G$in the sense that

$$c(v) = \frac{(s-1)}{s} \cdot d^{'} * j(-v) - 1.$$

Then the odd parts of functions$d$and$d^{'}$do coincide, i.e.,$d^{'}(v) - d^{'}(-v) = d(v) - d(-v)$

In particular, if$s = 3$then

$$d^{'}(v) = d(v) \forall v \in G.$$

Proof. If $l : G \to \mathbb{C}$ is a complex-valued function on $G$ and $\chi : G \to \mathbb{C}^*$ is a character (homomorphism group) then we write

$$a_\chi(l) = \frac{1}{s-1}\sum_{h\in G} l\,(h)\chi(h)$$

for the corresponding Fourier *coefficient* of $l$. We have

$l(v) = \sum_{\chi\in\hat{G}} a_\chi\,(l)\chi(v)$ where $\hat{G} = Hom(G, \mathbb{C}^*)$ (18)

Let us consider the function

$b : G \to \mathbb{C}, b(v) = d^{'}(v) - d(v).$

What we need to check is that

$$b(v) = b(-v) \forall v \in G,$$

which means that for all odd characters $\chi$ (i.e., characters $\chi$ of $G$ with

$$\chi(-1 mod\, s) = -1)$$

the corresponding Fourier coefficient

$$a_\chi(b) = 0.$$

It follows from (8) that $b * j(-v) = 0$ for all $v \in G$, i.e.,

$$b * j(v) = 0 \forall v \in G.$$

This implies that

$$0 = a_\chi(b * j) = a_\chi(b \cdot a_\chi(j) \forall \chi \in (G) \wedge.$$

However, $a_\chi(j) \neq 0$ for all odd $\chi$: it follows from [3,7,13]. This implies that $a_\chi(b) = 0$ for all odd $\chi$. This ends the proof of the first assertion.

Now let $s = 3$. Then $2 + 2n/(s-1) = n + 2$ and $G = \{1, -1\}$. We already know that

$d'(1) - d'(-1) = d(1) - d(-1)$.

Now has only to recall that

$d'(1) + d'(-1) = n + 2 = d(1) + d(-1)$.

**Remark 2.12.** If $v \in G$ then there is an integer $p_v$ that does *not* divide $s$ and such that $j(vh) - pj(h)$ is *divisible* by $s$ for all $h \in G$. Indeed, the function

$\gamma : G \to (\mathbb{Z}/s\mathbb{Z})^*, h = jmod\ s \mapsto j(h)mod\ s = jmod\ s$

is a homomorphism group. Hence,

$$\gamma(vh) = \gamma(v)\gamma(h) \forall v, h \in G.$$

Let us choose an integer $p_v \in \mathbb{Z}$ such that

$p_v$ mod $\mathbb{Z} = \gamma(h) = j(h)$ mod Z.

$s$ does *not* divide $p_v$ and

$j(vh)mod\ s = \gamma(vh) = \gamma(v) \cdot \gamma(h) = (p_v mod\ s) \cdot \gamma(h) = (p_v mod\ s) \cdot (j(h)mod\ s)$ . This implies that $j(vh) - pj(h)$ is *divisible* by $s$ for all $v \in G$.

**Corollary 2.13**. Let$a: G \to \mathbb{Z}$be an integer-valued function. Then conditions are equivalent as follows.

(i) $a * h(1mod\ s) = \sum_{h \in G} a\,(h) j(h^{-1}) \in s\mathbb{Z}$.

(ii) $a * h(h) = \sum_{h \in G} a\,(h) j(v/h) \in s\mathbb{Z} \forall v \in G$.

Proof. Notice that in light of Remark 2.12 (applied to $h^{-1}$), if $v \in G$ then there exists $p_v \in \mathbb{Z}$ such that $j(v/h) - pj(h)$ is divisible by $s$ for all $h \in G$. In other words, $j(v/h) \equiv p_v j(h) mod\ s$ and therefore

$$\sum_{h \in G} a\,(h) j(v/h) \equiv p_v \sum_{h \in G} a\,(h) j(h^{-1}) mod\ s \forall v \in G$$

This proof is completed.

### 3. A construction of Jacobians

Theorem 2.3 may be considered as an inverse of the following theorem.

**Theorem 3.1.**Consider$n$to be a positive integer, $s$an odd prime, $\omega_s \in \mathbb{C}$a primitive $p^{th}$ root of unity, and$G = (\mathbb{Z}/s\mathbb{Z})^*$. Suppose that$(s-1)$*divides*$2n$. *Let*$d: G \to \mathbb{Z}_+$be a non-negative integer-valued function such that

(i) $\sum_{h \in G} d\,(h) = \frac{2n}{s-1} + 2.$ (19)

(ii) $d * j(1 mod\ s) = \sum_{h\in G} d\ (h)j(h^{-1}) \in s\mathbb{Z}$ (20)

Let$\{l_h(z)|h \in G\}bec(s-1)$-element set of mutually prime nonzero polynomials$l_h(z) \in \mathbb{C}[z]$that enjoy the following properties.

(1) deg $(l_h) = d(h)$for all$h \in G$. In particular, $l(z)$isa (nonzero) constant polynomial if and only if $d(h) = 0$.

(2) Each$l(z)$has no repeated roots.

Let us consider a polynomial

$$l(z) = l_d(z) = \prod_{h\in G} l_h\ (z)^{j(h^{-1})} \in \mathbb{C}[z]$$

of degree$\sum_{h\in G} d(h)j(h^{-1})$. Suppose$C$be the smooth projective model of the irreducible plane affine curvature

$x^2 = l_d(z)$ (21)

endowed with an automorphism$\alpha_C: C \to C$induced by

$(z, x) \mapsto (z, \omega_s x)$.

Suppose that the canonically principally polarized Jacobian of$C$ is $(\mathcal{J}, \partial)$endowed by the automorphism$\alpha$ induced by$\alpha_{CV}$. Then$\mathcal{J}$and$\alpha$enjoy the following properties.

(a) dim $(\mathcal{J}) = n$

(b) $\sum_{j=0}^{s-1} \alpha^j = 0$in End $(\mathcal{J})$.

Let a: $G \to \mathbb{Z}_+$be the corresponding multiplicity function attached to the action of $\alpha$on thedifferentials of the first kind on$Z(2)$. Then

$$c(v) = \frac{(s-1)}{s} \cdot d * j(-v) - 1 \forall v \in G.$$

Proof. If $\psi$ is a root of $l(z)$ then there is exactly one $h \in G$ that $\psi$ is a root of $l_h(z)$ ; in addition, the multiplicity of $\psi$ (viewed as a root of $l(z)$ ) is $j(h^{-1}$, which is not divisible by $s$. This infers that $l(z)$ is not a $p^{th}$ power in the polynomial ring $\mathbb{C}[z]$ and even in the field of rational function $\mathbb{C}(z)$. It follows from theorem 9.1 of [4] that the polynomial $x^s - l(z) \in \mathbb{C}(z)[x]$ is irreducible over $\mathbb{C}[z]$. This implies that the polynomial in two variables$x^s - l(z) \in \mathbb{C}[z, x]$ is irreducible because every divisor that is a polynomial in $z$ is a constant. i.e., the affine plane curvature(21)is irreducible and its field of rational functions $K$ is the field of fractions of the domain

$$A = \mathbb{C}[z, x]/(x^s - l(z))\mathbb{C}[z, x].$$

Let smooth projective model of (21) is $C$. Then $K$ is the field $\mathbb{C}(C)$ of rational functions on $C$; in particular, $\mathbb{C}(C)$ is generated over $\mathbb{C}$ by rational functions $z, x$. Let $\pi : C \to \mathbb{P}^1$ be the regular map clear by rational function $z$. It has a degree $s$. Since

$$\deg(\pi) = \deg(l) = \sum_{h\in G} d\ (h)j(h^{-1})$$

is divisible by $s$, the map $\pi$ is unramified at $\infty$ (see $Rejeat^{*}8\mathcal{M}$ Sect. 4]) and therefore the set of branch points of $\pi$ coincides with the set of roots of $l(z)$.

The disjoint union of the sets $R_h$ of roots of $l_h(z)$ . In particular, the number ofbranch points of $\pi$ is

$\sum_{h\in G} \deg\ (l_h) = \sum_{h\in G} d\,(h) = \frac{2n}{s-1} + 2.$

$\pi$ is a Galois cover of degree $s$, i.e., the field extension.

$\mathbb{C}(C)/\mathbb{C}(\mathbb{P}^1) = \mathbb{C}(C)/\mathbb{C}(z)$

is a cyclic field extension of degree $s$. In addition, the cyclic Galois group $Gc1(\mathbb{C}(C)/\mathbb{C}(\mathbb{P}^1))$ is generated by the automorphism $\alpha_C : C \to C$ induced by$\alpha_C : C \to C, (z, x) \mapsto (z, \omega_s x)$.

It follows from the Riemann-Hurwitz formula [8] that the genus of $C$is

$$\frac{\left(\left(\frac{2n}{s-1} + 2\right) - 2\right)(s-1)}{2} = n.$$

In addition, the automorphism $\alpha$ of the polarized jacobian $(\mathcal{J}, \partial)$ induced by $\alpha_C$

satisfies the $s$th cyclotomic equation

$$\sum_{j=0}^{s-1} \alpha^j = 0 \text{ in End } (\mathcal{J})$$

Suppose thatthe set of ramification points of $\pi$ is $B \subset C(\mathbb{C})$. $B$accords with the

usual of static points of $\alpha_C$. The map $z : C(\mathbb{C}) \to \mathbb{P}^1(\mathbb{C})$ establishes a bijection between

$B$ and the disjoint union of all $R_h$'. Let us putting

$$B_h = \{P \in B | z(P) \in R_h\}.$$

Then $B$ partitions onto a disjoint union of all $B_h$'s and

$$\#(B_h) = \deg\,(l_h) = d(h) \forall h \in G.$$

Let $P \in B$. The action of $\alpha$ on the tangent space to $C$ at $P$ is multiplication by a

certain $p^{th}$ root of unity $\varepsilon_P$. We observe and claim that$\varepsilon_P = \omega_s^{j(h)}$ if $P \in R_h$.

Indeed, we have

$$z(P) = \psi \in R_h, x(P) = 0.$$

Let

$$ord_P : \mathbb{C}(C) \to \mathbb{Z}$$

be the discrete valuation map attached to $P$. Then one may easily check that

$$ord_P(z - \psi) = s, ord_P(z - \xi) = 0 \forall \xi \in \mathbb{C} \backslash \psi.$$

This implies that

$s \cdot j(h^{-1}) \cdot ord_P(z - \psi) = ord_P(x^s) = s \cdot ord_P(x)$

and therefore

$ord_P(x) = j(h^{-1})$ (22)

In light of (5), there is an integer $m$ such that

$$j(h^{-1}) \cdot j(h) = 1 + sm.$$

Combining this with(22), we obtain that

$$ord_P\left(\frac{x^{j(h)}}{(z-\psi)^m}\right) = j(h^{-1}) \cdot j(h) - sm = 1$$

and therefore $t := x^{j(h)}/(z-\psi)^m$ is a *local* parameter of $C$ at $P$. The action of $\alpha$ multiplies $t$ by $\omega_s^{j(h)}$ and therefore $\varepsilon_P = \omega_s^{j(h)}$, which proves the Claim.

Now the desired result follows from Proposition 1.11 applied to $Z = \mathcal{J}, \beta = \alpha$.

**Example 3.2.** Let $s = 3$. The number of admissible functions is $(n+1)$.

Let us list all the possibilities for a when $n$are given. Let us identify

$$G = (\mathbb{Z}/3\mathbb{Z})^* = \{1mod\ 3, 2mod\ 3\}$$

with the set $\{1, 2\}$ in an obvious way. We have the following conditions on $d$.

$d(1), d(2) \in \mathbb{Z}_+, d(1) + d(2) = n + 2, 3|(d(1) + 2d(2))$ .

The congruence condition means that $d(1) \equiv d(2) mod\ 3$. So, the conditions on $d$ are as follows.

$$d(1), d(2) \in \mathbb{Z}_+, d(1) + d(2) = n + 2, d(1) \equiv d(2) mod\ 3.$$

The list (and number) of corresponding a depends on $n mod\ 3$. Namely, there are the natural three cases.

(i) $n \equiv 1 mod\ 3$, i.e., $n = 3p + 1$ where $p$ is a nonnegative integer. Then

$d(1) + d(2) = n + 2 = 3p + 3 = 3(p + 1)$,

and therefore both $d(1)$ and $d(2)$ are divisible by 3. Hence there are exactly $(p + 2)$ options for $d$, namely,

$d(1) = 3b, d(2) = 3(p + 1 - b); b = 0, \dots, (p + 1)$ (23)

The corresponding a are as follows (where $b = 0, \dots, (p + 1$

$$c(2) = \frac{1}{3}(d(1) + 2d(2)) - 1 = b + 2 \cdot (p + 1 - b) - 1$$

$$= b + 2(p + 1 - b) - 1 = (2p + 1) - b;$$

$$c(1) = \frac{1}{3}(2d(1) + d(2)) - 1 = 2b + (p + 1 - b) - 1 = p + b.$$

So, we get

$$c(1) = p + b, c(2) = (2p + 1) - b; b = 0, \dots, p + 1.$$

The number of a's is

$p+2=\frac{n+5}{3}$.

(ii) $n \equiv 2 mod\ 3$, i.e., $n=3p+2$. Then

$d(1)+d(2)=n+2=3p+4=3(p+1)+1,$

In above$p$ is a non-negative integer and therefore both $d(1)-2$ and $d(2)-2$ are divisible by 3. Hence there are exactly $(p+1)$ options for $d$, namely,

$d(1)=3b+2, d(2)=3(p-b)+2; (b=0,\dots,p)$

The corresponding a are as follows (where $b=0,\dots,p$).

$c(2)=\frac{1}{3}(d(1)+2d(2))-1=b+2(p-b)+2-1=(2p+1)-b;$

$$c(1)=\frac{1}{3}(2d(1)+d(2))-1=2b+(p-b)+2-1=(p+1)+b=p+b.$$

So, we get

$c(1)=(p+1)+b, c(2)=(2p+1)-b; b=0,\dots,p.$

The number of a's is

$p+1=\frac{n+1}{3}$.

(iii) $n \equiv 0 mod\ 3$, i.e., $n=3p$. Then

$d(1)+d(2)=n+2=3p+2,$

In above$p$ is a non-negative integer and therefore both $d(1)-1$ and $d(2)-1$ are divisible by 3. Hence there are exactly $(p+1)$ options for $d$, namely,

$$d(1)=3b+1, d(2)=3(p-b)+1; (b=0,\dots,p)$$

The corresponding a are as follows (where $b=0,\dots,p$).

$c(2)=\frac{1}{3}(d(1)+2d(2))-1=b+2(p-b)+1-1=2p-b;$

$c(1)=\frac{1}{3}(2d(1)+d(2))-1=2b+(p-b)+1-1=p+b.$

So, we get

$c(1)=p+b, c(2)=2p-b; b=0,\dots,p.$ (24)

The number of a's is

$p+1=\frac{n+3}{3}$. (25)

The above result shows that where $p$ is a non-negative integer congruence condition are satisfies.

**4. Conclusion**

The Dynein network of  can be used to represent the most periodic reduced subalgebras of a simple Lie algebra . Clearly, any such subalgebra arises as a semi simple Lie algebra with a Dynein diagram obtained by deleting one node from the Dynein circuit of  with a mark equal to 1 direct sum and asymmetric subalgebra composed of the intersect of the husks of the remaining roots. Finally, the well-known constraints on the algebraic formulations of its action on first-order distinctions suggest that such polarized varieties are not Jacobians of curvatures.

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