ERRATA FOR "NEW METHODS FOR (φ, Γ)-MODULES"

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Example 1.3.6: in the display, $\mathbb{F}_p$ should be $\mathbb{F}_q$, the residue field of F.

Lemma 1.5.4: in line 10 of the proof, "smallest norm of a norm" should be "smallest norm of a root". In line 12, $\bar{R}_0 = 0$ should read $\bar{R}_0 = 1$.

Theorem 1.6.2: in the last paragraph of the proof, "tu is divisible by p^n" should be "p^n is divisible by tu."

Theorem 1.6.4: in the first paragraph of the proof, $\bar{u}$ must be nonzero. In the equation $x = \text{Trace}(y) + pz$, the left-hand side should be $x/(p/t)^{m-1}$.

Lemma 1.7.4: Equation (1.7.4.1) should read

$$|\overline{x}_n - \overline{y}_n|' \leq c^{1/r} p^{n/r} \max\{p^{-m/(p^m r)} \epsilon^{1/(p^m r)} : m = 0, \dots, n\};$$

we include a derivation of this below. This does not affect the construction of $x \in W^{r-}(F)$ or the estimate $|x|_r \leq c$; however, the proof that $x_1, x_2, \dots$ converges to x when $x = 0$ must be modified, as the corrected estimates do not suffice to imply this. Instead, for each i, we simply repeat the preceding argument for the sequence $\{x_i - x_j\}_{j>i}$ to deduce that $|x_i|_r \leq \sup\{|x_i - x_j|_r : j > i\}$, which implies that $x_i \to 0$.

We now derive the corrected version of (1.7.4.1) stated above, by induction on n. For $i = 1, \dots, n$, let z_i be the quantity obtained from $[\overline{x}_{n-i}] - [\overline{y}_{n-i}]$ by truncating the sum after the p^i term; then

$$p^n[\overline{x}_n - \overline{y}_n] \equiv x - y - \sum_{i=1}^{n} p^{n-i} z_i \pmod{p^{n+1}}$$

and so

$$|[\overline{x}_n - \overline{y}_n]|_r \leq \max\{cp^n\epsilon, \max\{p^i |z_i|_r : i = 1, \dots, n\}\}.$$

By the induction hypothesis,

$$\left|\overline{x}_{n-i} - \overline{y}_{n-i}\right|' \leq c^{1/r} p^{(n-i)/r} \max\{p^{-j/(p^j r)} \epsilon^{1/(p^j r)} : j = 0, \dots, n-i\};$$

using Remark 1.1.7, this implies

$$|z_i|_r \leq cp^{n-i} \max\{p^{-k} p^{-j/p^{j+k}} \epsilon^{1/p^{j+k}} : j = 0, \dots, n-i; k = 0, \dots, i\}.$$

This bound is only valid for $i > 0$, but if we take $i = 0$, then the right side is no less than $cp^n\epsilon$ on account of the term $j = k = 0$. Consequently, we may take the maximum over $i = 0, \dots, n$ to deduce that

$$|[\overline{x}_n - \overline{y}_n]|_r \leq cp^n \max\{p^{-i-k}(p^{-j}\epsilon)^{1/p^{j+k}} : i = 0, \dots, n; j = 0, \dots, n-i; k = 0, \dots, i\}.$$

We may weaken the bound by replacing p^{-i-k} with $p^{-k/p^{j+k}}$, and then rewrite the bound in terms of $m := j + k$ to get

$$|[\overline{x}_n - \overline{y}_n]|_r \leq cp^n \max\{(p^{-m}\epsilon)^{1/p^m} : m = 0, \dots, n\},$$

which yields the desired result.

Lemma 2.4.2: the application of Theorem 2.3.5 in the first paragraph of the proof is not quite appropriate, because we do not assume the presence of an action of Γ. What we are really using here is the proof method of Lemma 2.3.4; that is, we construct L' from L by a sequence of Artin-Schreier extensions obtained by trivializing the action of φ modulo successive powers of p.

Lemma 2.4.4: in the statement, "basis of $W(L)$" should be "basis of M". In the proof, $\varphi^d(U_n)$ and $\varphi^d(U)$ should be $\varphi(U_n)$ and $\varphi(U)$, respectively.

Lemma 2.5.1: In line 3 of the proof, there should be no factor of $|\overline{\pi}|'$ on the right side. In the next line, $c = 1$ should be $c = (|\overline{\pi}|')^{-1})$.