Erratum to “Local Zeta Functions for Non-degenerate Laurent Polynomials Over p-adic Fields”

By E. León-Cardenal and W. A. Zúñiga-Galindo

The condition on the critical set for the mapping $f$ considered in Section 2.5 of our article is not sufficient to assure the vanishing of the local zeta functions $Z_{\Phi}(s, \chi, f)$ for almost all $\chi$ as we assert in Theorem 3.9. The following modifications should be done.

1. In Section 2.5, the first four lines should be replaced by the following text: We consider $f$ as a regular function on $T^n(K)$. The critical set of $f$ is $C_f := C_f(K) = \{x \in T^n(K), \nabla f(x) = 0\}$. Notice that by the non-degeneracy condition on $f$, $C_f \cap f^{-1}(0) = \emptyset$. Later on we will use the following condition: (A) $C_f = \emptyset$; (B) let $\mathcal{F}$ be a fixed simple, non trivial, fan subordinated to $\Gamma_\infty$. For any $n$–dimensional cone $\Delta$ in $\mathcal{F}$ spanned by $a_1, \ldots, a_n$, $d(a_j) \neq 0$ for any $j$ in (2.3). We will call these conditions Hypothesis H1.

Hypothesis H1 is necessary to assure the vanishing of the twisted local zeta functions, and thus, to use Igusa’s method for estimating $p$-adic oscillatory integrals.

2. In the statement of Theorem 3.9 the condition “$C_f \subset f^{-1}(0)$” must be replaced by “Hypothesis H1”.

3. In the statement of Theorem 4.2, the first four lines must be replaced by: Let $f$ be a Laurent polynomial which is weakly non-degenerate with respect to $\Gamma_\infty$, with $\dim \Gamma_\infty = n$. Let $\mathcal{F}$ be a nontrivial simple fan subordinated to $\Gamma_\infty$ as before. Assume that $f$ satisfies Hypothesis H1. Then the following assertions hold.

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In addition in the second line of Section 2.4.1, \( \sum_{m \in \mathbb{Z}} \) should be replaced by \( \sum_{m \in \mathbb{Z}_n} \). In line 9 in page 578, \( \sum_{m \notin \tau' \cap \text{supp}(f)} \) in the definition of \( f_{\Delta, \tau'}(y) \) should be replace by \( \sum_{m \in \tau' \cap \text{supp}(f)} \).

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