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Errata

Three constructions of rational points on $Y^2 = X^3 \pm NX$

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Lemma 4.7, and the expression for W in terms of Fricke functions given in Theorem 4.8 are false. In fact, as φ is defined, $\varphi^8 f^{24}$ has zeros at the cusps $\frac{1}{2}$ and 2 of $C(4)$ and poles at the cusps lying over 1; I thank Andre Robatino for pointing this out to me.

To get a correct expression for W and a correct proof of the main lemma one may proceed as follows. Let $\bar{E}_4 = \bar{e}_{0,4} - \bar{e}_{4,4}$, $\bar{E}_5 = \bar{e}_{4,0} - \bar{e}_{4,12}$ and $\bar{E}_6 = \bar{e}_{4,8} - \bar{e}_{8,4}$. Set $\varphi = \bar{E}_1 \bar{E}_2 \bar{E}_6 / \bar{E}_3 \bar{E}_4 \bar{E}_5$. Then φ is modular of level 16, holomorphic in $\mathfrak{H}$. The proof that φ satisfies the functional equations of Lemma 4.6 goes through with obvious modifications. With this choice of φ one may verify that $\varphi^8 f^{24}$ is holomorphic at the cusps of $C(4)$; since it is holomorphic in the upper half-plane it is constant. Arguing as in the proof of Theorem 4.8 we get an expression for W in terms of Fricke functions; $W = 32(1-i)\cdot 2^{1/4} \cdot \bar{E}_3 \bar{E}_4 \bar{E}_5 / \bar{E}_1 \bar{E}_2 \bar{E}_6$. The argument in the rest of Sect. 4, establishing the main lemma, works with trivial modifications.