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Periods of rational maps modulo primes

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(Submitted on 14 Jul 2011)

Let K be a number field, let $\phi \in K(t)$ be a rational map of degree at least 2, and let $\alpha, \beta \in K$. We show that if α is not in the forward orbit of β , then there is a positive proportion of primes $\frac{p}{\mathfrak{p}}$ of K such that $\alpha \pmod{\mathfrak{p}}$ is not in the forward orbit of $\beta \pmod{\mathfrak{p}}$.

Moreover, we show that a similar result holds for several maps and several points.

We also present heuristic and numerical evidence that a higher dimensional analog of this result is unlikely to be true if we replace α by a hypersurface, such as the ramification locus of a morphism $\phi : \mathbb{P}^n \rightarrow \mathbb{P}^n$.

Subjects: **Algebraic Geometry (math.AG)**; Number Theory (math.NT)

MSC classes: Primary: 14G25, Secondary: 37F10, 37P55

Cite as: **arXiv:1107.2816 [math.AG]**

(or **arXiv:1107.2816v1 [math.AG]** for this version)

Submission history

From: Thomas Scanlon [[view email](#)]

[v1] Thu, 14 Jul 2011 13:35:46 GMT (238kb,D)

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