1145-03-1046 **Julia F. Knight*** (knight.1@nd.edu), **Karen Lange** and **Reed Solomon**. *Roots of polynomials in fields of generalized power series.*

Let K be an algebraically closed field of characteristic 0. Newton and Puiseux showed that the field $K\{\{t\}\}$ of *Puiseux series* is algebraically closed. Maclane showed that for a divisible Abelian group G, the field $K((G))$ of *Hahn series* is algebraically closed. Puiseux series have length at most ω. For a given polynomial $p(x)$, Newton's method for finding roots does not look computable. However, guessing at the non-computable bits, we get a uniform effective procedure that, when applied to any K and a non-constant polynomial $p(x)$ over $K\{\{t\}\}$, yields a root. Hahn series have ordinal length. We can show that if $p(x)$ is a polynomial and γ is a limit ordinal greater than the lengths of all coefficients in $p(x)$, then the roots all have length less than ω^{ω^γ}. At least for countable ordinals γ, this is sharp. We would like to measure, in terms of the usual hierarchies from computability, the complexity of the process that, for a computable ordinal α, given K, G, and a polynomial $p(x)$ over $K((G))$, either produces r_α of length α that is an initial segment of a root, or else determines a root r of length less than α. (Received September 18, 2018)