SPECIFYING CYCLES FOR NEWTON MAPS

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ABSTRACT. We show that for any set of n distinct points in the complex plane, there exists a polynomial $p(z)$ of degree at most $n+1$ so that the corresponding Newton map, or even the relaxed Newton map, for $p(z)$ has the given points as a super-attracting cycle. This improves the result due to Plaza and Romero (2011), which shows how to find such a polynomial of degree $2n$. Moreover we show that in general one cannot improve upon degree $n+1$. Our methods allow us to give a simple, explicit, constructive proof of the known result that for each cycle length n greater than or equal to 2, and degree d greater than or equal to 3, there exists a polynomial of degree d whose Newton map has a super-attracting cycle of length n.

Joint work with Jared T. Collins.