1056-37-45 **J. D. Mireles-James*** (jjames@math.utexas.edu), Department of Mathematics, 1 University Station C1200, Austin, TX 78712-0257, and **Hector Lomeli**. *Computation of Heteroclinic Arcs for Diffeomorphisms of* $\mathbb{R}^3$.

Let f be a diffeomorphism of $\mathbb{R}^3$ with hyperbolic fixed points p_1 and p_2. Suppose that p_1 has two dimensional unstable, and p_2 two dimensional stable manifold. If $W^u(p_1)$ and $W^s(p_2)$ intersect transversally at a point q, then the orbit of q is homoclinic from p_1 to p_2.

By transversality the intersection at q is locally a one dimensional arc $\gamma \subset W^u(p_1) \cap W^s(p_2)$ through q. It follows that if $q' \in \gamma$, then q' is heteroclinic as well. We give a method for computing arbitrarily high order polynomial expansions of the arc γ, and apply the method to the Volume Preserving Henon Family.

The idea is to express γ as a zero of a functional equation, which is solved via a Newton scheme. A feature of the method is that the arcs, as well as the stable and unstable manifolds, are computed quickly with very high precision. A typical computation takes minutes and results in polynomial approximations of the desired manifolds which are accurate to within ten to fifty multiples of machine epsilon. The method applies to difference equations which can be expressed as diffeomorphisms of $\mathbb{R}^3$. (Received July 10, 2009)