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J D Mireles James* (jjames@math.rutgers.edu), **J P Lessard**, **K M Mischaikow** and **J B van den Berg**. *Rigorous Computation of Connecting Orbits for Flows I: Problem Description and Parameterization of Invariant Manifolds.*

We discuss a numerical scheme which leads to computer assisted proof of the existence of connecting orbits for ordinary differential equations. The problem is formulated as a finite time boundary value problem by exploiting a high-order parameterization of the invariant manifolds at the equilibria. The boundary value problem is solved numerically via piecewise linear finite element approximations and a Newton Scheme. We construct an operator on a function space whose unique fixed point corresponds to the desired connecting orbit, and rigorously establish that the operator is a contraction mapping in some neighborhood of the numerical solution. In part I we focus on the problem set up, and discuss the parameterization of the invariant manifolds. (Received January 11, 2010)