1063-76-181 **Jon Wilkening*** (wilken@math.berkeley.edu), Department of Mathematics, University of California, Berkeley, CA 94720-3840. *Computation of time-periodic water waves.*

We develop a quasi-Newton trust-region shooting algorithm for solving two-point boundary value problems governed by nonlinear partial differential equations. We use our method to compute families of (time-periodic) standing water waves in two and three dimensions. To evolve the water wave in time, we use a spectrally accurate boundary integral collocation method in 2D, and a 5th order finite element method in 3D. As a starting guess, we use analytically determined time-periodic solutions of the linearized problem about a flat surface. We then use our numerical method to continue these solutions beyond the realm of linear theory to explore their behavior. Preliminary results suggest that if limiting wave profiles exist in the two-dimensional case, they have more complicated singularities than the 90 degree angles previously conjectured. (Received August 16, 2010)