Large Amplitude Oscillations of a Double Pendulum JEFFREY M.
GERRES, ROBERT M. JACOBS, SARA F. KASUN, MARGARET E. BACON,
CHAKRAVARTHI M. NAGOLU, ERIN L. OWENS, KEVIN F. SIEHL, MAR-
SHALL THOMSEN, JON S. TROYER, Eastern Michigan University — The nature
of the normal modes of oscillation in the small angle regime of a double pendulum
is well established. However, for large amplitude oscillations, a closed form solution
of the differential equations of motion does not exist. Using Lagrange formalism, we
explore both the in-phase and out-of-phase normal modes of oscillation of a double
pendulum as a function of the mass ratio of the two bobs and their initial angular
positions. We conduct the analysis using MatLab, where we initially verify our code
in the known small amplitude limit. Among our results we find that certain sym-
metries between the in-phase and out-of-phase normal modes that exist in the small
amplitude limit are no longer present at large amplitudes.

Marshall Thomsen
Eastern Michigan University