Vibrations and waves: exercise sheet 6

Double pendulum

Consider a pendulum consisting of a string and two weights, one at distance L_1 from the top and the other at distance L_2 below the upper weight. Both weights have mass m.

1. Write the energy of the system when both weights swing, in terms of the horizontal displacements.
2. Write the equations of motion of both weights from the force and accelerations
3. Calculate the two normal mode frequencies
4. Calculate expressions for the two normal mode frequencies, and then simplify for the case that $L_2 = L_1/2$.