PHYS-UA 120 Dynamics Problem Set 10

Due in the "Dynamics" hand-in box before noon on 2014 November 20.

Problem 1:

Complete the problem we started in class on Thursday November 13, with two masses of mass M connected to the walls with springs of spring constant k and to each other by a spring of constant K. Write down the Lagrangian in each of the two generalized coordinate systems we wrote down, the μ and κ tensors, and then get the eigenvalues and eigenvectors. Do these confirm our expectations about ω^2 and the eigenvectors for both modes in both coordinate systems?

Problem 2:

Kibble & Berkshire, Ch 11, problem 1

Problem 3:

Write a `Python` computer program that generates the matrix on the left-hand side of equation (11.33) in the book, for any arbitrary number n. Write also the code that obtains its eigenvalues and eigenvectors (`numpy.linalg` is your friend here; it may be a one-liner). Now plot the lowest-frequency (not highest) 4 modes (in the style of Fig 11.6 in the book) for the case of $n = 32$. Label each plot with the computed frequency of that mode, and compare it to the frequency you would expect for the corresponding mode from the continuous string of length $[n + 1]\,\ell$.