

HOMEWORK 11 — PHZ 3113

(April 15, 2015)

For small oscillation the equations of motion of a double pendulum are in matrix notation

$$\begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} \ddot{\phi} \\ \ddot{\psi} \end{pmatrix} + \begin{pmatrix} 2g/l & 0 \\ 0 & g/l \end{pmatrix} \begin{pmatrix} \phi \\ \psi \end{pmatrix} = 0 .$$

1. Calculate the normal modes (eigenfrequencies) of the pendulum.
2. Use the eigenfrequencies and normal coordinates to write down the general solution for the two angles.
3. Express the integration constants of your solution through the angular positions and velocities at time $t = 0$, denoted by $\phi_0, \dot{\phi}_0, \psi_0, \dot{\psi}_0$.