6. String-coupled masses (5 points) — *Aleksi Kononen.*

Two small masses m are connected and hung between walls by weightless strings as pictured below. The acceleration due to gravity is g. All oscillatory motion is assumed to have a small amplitude and the system is always in one of its normal modes (i.e. the oscillations are sinusoidal).

i) *(2 points)* Find ω_1, the angular frequency of in-phase oscillations (by which the oscillation phases of the both masses are always equal), perpendicular to the plane of the figure.

ii) *(3 points)* Find ω_2, the angular frequency of anti-phase oscillations (by which the oscillation phases of the both masses are always opposite), in terms of ω_1.