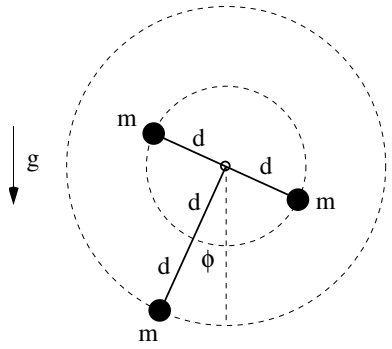
[mex264] T-pendulum

Consider a plane pendulum consisting of three pointlike masses m at the ends of a T-shaped rigid frame of negligible mass and dimensions as shown.
(a) Find the Lagrangian $L(\phi, \dot{\phi})$ and derive the Lagrange equation from it.
(b) Find the Hamiltonian $H(\phi, p_\phi)$ and derive the canonical equations from it.
(c) Find the angular frequency ω_0 of small oscilations about the stable equilibrium.
(d) Find the angular momentum ℓ when $\phi = 0$ if the pendulum is released from rest at $\phi = \pi/2$.



Solution: