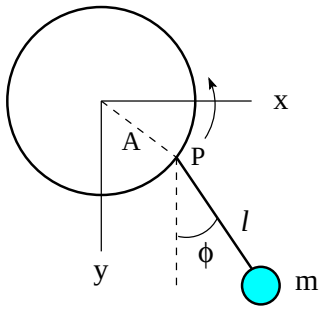
[mex250] Plane pendulum with periodically driven pivot III

Consider a mathematical pendulum (mass m, length ℓ) with the pivot P rotating counterclockwise along a circle in a vertical plane, $x_P = A\cos\omega t$, $y_P = -A\sin\omega t$. Show that the Lagrangian is

$$L = \frac{1}{2}m\ell^2\dot{\phi}^2 + mA\omega^2\ell\sin\left(\phi - \omega t\right) + mg\ell\cos\phi.$$



Solution: