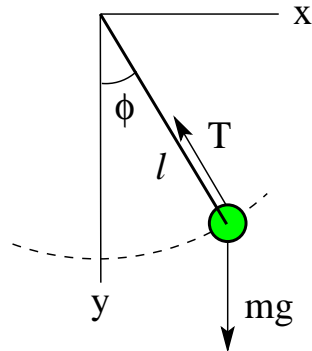


[mex132] Plane pendulum I

Derive the equation of motion $\ddot{\phi} + (g/l) \sin \phi = 0$ for the (generalized) angular coordinate ϕ within the framework of Newtonian mechanics by proceeding as follows:

- State the two equations of motion for the Cartesian coordinates x, y in terms of the known applied force $m\mathbf{g}$ and the unknown force of constraint (tension \mathbf{T}).
- Derive two additional relations between the four unknowns x, y, T_x, T_y geometrically from the constraint.
- Introduce the angular coordinate ϕ and derive from the four equations established previously one equation for ϕ .



Solution: