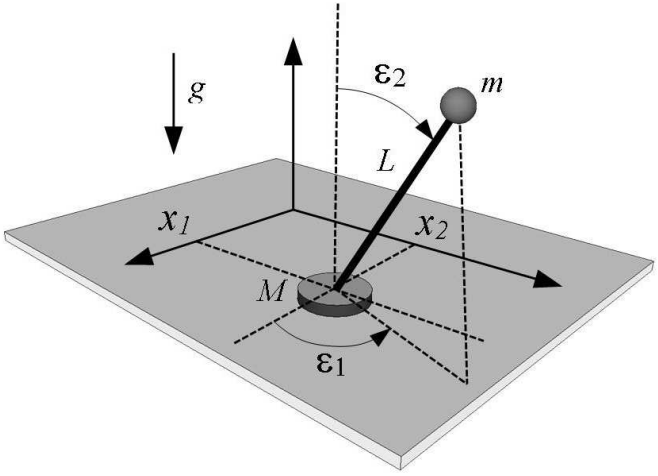
Homework 2: Task 1



The system has four generalized coordinates: (x_1, x_2) are variables for representing the position of the puck on a plane; $(\varepsilon_1, \varepsilon_2)$ are two angles (precession and nutation) for representing the status of the pendulum.

The dynamics of the system are

$$\frac{d}{dt}\left[\frac{\partial \mathcal{L}}{\partial \dot{\varepsilon}_1}\right] - \frac{\partial \mathcal{L}}{\partial \varepsilon_1} = 0 \qquad \frac{d}{dt}\left[\frac{\partial \mathcal{L}}{\partial \dot{\varepsilon}_2}\right] - \frac{\partial \mathcal{L}}{\partial \varepsilon_2} = 0$$

$$\frac{d}{dt}\left[\frac{\partial \mathcal{L}}{\partial \dot{x}_1}\right] - \frac{\partial \mathcal{L}}{\partial x_1} = F_1 \qquad \frac{d}{dt}\left[\frac{\partial \mathcal{L}}{\partial \dot{x}_2}\right] - \frac{\partial \mathcal{L}}{\partial x_2} = F_2$$

with F_1, F_2 being external forces acting on the puck along x_1, x_2 axes

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The task: to find a behavior of the system when the puck is forced to move along of a circle of a radius R while the pendulum stays above the horizontal for all time moments.