

[mex258] Rod off balance

A uniform rod of mass m and length l is positioned upright ($\theta = 0$), initially at rest, on a slippery floor (x -axis) against a slippery wall (y -axis). The unstable equilibrium is upset when, in the absence of friction, the two ends of the rod begin to slide as shown under the influence of a uniform gravitational field g .

- (a) Find the kinetic energy T as a function of the angle θ .
- (b) Find the components p_x, p_y of the center-of-mass momentum as functions of the angle θ .
- (c) Identify an attribute in the results of parts (a) or (b) that can be used as a criterion to determine if and when the rod loses contact with the wall during its fall.
- (d) Find (or show how to determine) the angle θ_c at which the rod does indeed lose wall contact.

Solution:

