FYS3120 Classical Mechanics and Electrodynamics

Problem set 4

February 12, 2019

Problem 1

a)

- $K = \frac{1}{2}I\dot{\theta}^2 = \frac{b}{2}\frac{1}{3}mb^2\dot{\theta}^2$, $V = -mb\frac{b}{2}cos\theta$

- $L = K - V = \frac{1}{2}\frac{1}{3}mb^2\dot{\theta}^2 + mb\frac{l}{2}cos\theta$

- $\frac{dL}{dt}\left(\frac{\partial L}{\partial\dot{\theta}}\right) - \frac{\partial L}{\partial\theta} = \frac{1}{3}mb^2\ddot{\theta} + mg\frac{b}{2}sin\theta = \ddot{\theta} + \frac{3g}{2b}sin\theta = 0$

Problem 2

a)

- $K = \frac{1}{2}m_1\dot{\vec{r}}_1^2 + \frac{1}{2}m_2\dot{\vec{r}}_2^2$, $V = |\vec{r}_1 - \vec{r}_2|c$, where c is a constant.

- $L = K - V = \frac{1}{2}m_1\dot{\vec{r}}_1^2 + \frac{1}{2}m_2\dot{\vec{r}}_2^2 - V(\vec{r}_1, \vec{r}_2)$

b) $\vec{r} = \vec{r}_1 - \vec{r}_2$