FYS3120 Classical Mechanics and Electrodynamics

Problem set 4

February 13, 2019

Problem 1

a)

- $K = \frac{1}{2} I \dot{\theta}^2 = \frac{b}{2} \frac{1}{3} m b^2 \dot{\theta}^2$, $V = -mb\frac{b}{2} cos\theta$
- $L = K - V = \frac{1}{2} \frac{1}{3} m b^2 \dot{\theta}^2 + mb\frac{l}{2} cos\theta$
- $\frac{dL}{dt}(\frac{\partial L}{\partial \dot{\theta}}) - \frac{\partial L}{\partial \theta} = \frac{1}{3} m b^2 \ddot{\theta} + mg\frac{b}{2} sin\theta = \ddot{\theta} + \frac{3g}{2b} sin\theta = 0$
- harmonic oscillaotr google

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) $\vec{r} = \vec{r}_1 - \vec{r}_2$, ,$\vec{R} = \alpha_1 \vec{r}_2 + \alpha_2 \vec{r}_2$, $\alpha_1 = \frac{m_1}{m_1 + m2}, \alpha_2 = \frac{m_2}{m_1 + m2}$