Lagrangian

$$T = \frac{1}{2}m_1(l_1\dot\theta_1)^2 + \frac{1}{2}\frac{1}{12}m_1l_1^2\dot\theta_1^2 + \frac{1}{2}\dot\theta_2^2 l_2^2 + \frac{1}{12}m_2l^2$$

$$V = -gm_1\frac{l_1}{2} - \frac{gm_2(l_1\cos\theta_1 + \cos\theta_2)}{l_2}{2}$$

$$L = T - V$$

$$\left(\frac{1}{3}m_2 l_2 l_1 \dot\theta_1 \right) + \left(\frac{1}{2} - \frac{m_2 l_1 l_2 \dot\theta_2^2}{2} \right)gl_1\sin\theta_1$$

$$\left(\frac{1}{2}(m_2 l_1 l_2)\ddot\theta_1 + \frac{1}{3}m_2 l_2^2 \ddot\theta_2 \overline{m}_2 \right)gl_2\sin\theta_2$$

$$\ddot\theta^1 = -\frac{3(gl_1 m_1 \sin\theta_1 + 2gl_1 m_2 \sin\theta_1 - gl_2 m_2 \sin\theta_2)}{2l_2 m_1 - 3l_1 l_2 m_2 + 6l_2 m_2}$$

$$\ddot\theta^2 = -\frac{3(-3gl_2 m_1 \sin\theta_1 - 6gl_2 m_2 \sin\theta_1 + 2gl_2 m_1 \sin\theta_2 + 6gl_2 m_2 \sin\theta_2)}{2l_2(2l_2 m_1 - 3l_1 l_2 m_2 + 6l_2 m_2)}$$