Answers exam 2 2016

1. $t^* = \dfrac{\mu g (m_1 + m_2)}{\beta \cos\theta}$

2. $y = \dfrac{v_3^2}{2g} = \dfrac{(m_1 + m_2)^2}{2g(m_1 + m_2 + m_3)^2}\left(2gH + v_1^2\right)$

3. $v = \sqrt{\dfrac{2}{m_1 + m_2}\left(-\mu_0 mg\cos\theta\left(H + \dfrac{H^3}{3s^2}\right) + (m_2 - m_1\sin\theta)gH\right)}$

4. Conservation of energy:

$$\frac{m v_m^2}{2} = \frac{m v_m^2 \cos^2\theta}{2} + mgH + \frac{\beta H^3}{3}$$

Or Work Energy Theorem:

$$W^{net} = \int_0^H (-mg - \beta y^2)\,dy = \frac{m v_m^2 \cos^2\theta}{2} - \frac{m v_m^2}{2}$$

$$v_m = \sqrt{\frac{2}{m\sin^2\theta}\left(mgH + \frac{\beta H^3}{3}\right)}$$