

$$m_1 \frac{d^2 x_1}{dt^2} = m_1 g + k_2(x_2 - x_1) - k_1 x_1$$

$$m_2 \frac{d^2 x_2}{dt^2} = m_2 g + k_3(x_3 - x_2) + k_2(x_1 - x_2)$$

$$m_3 \frac{d^2 x_3}{dt^2} = m_3 g + k_3(x_2 - x_3)$$