

$$\frac{d^2 I}{dt^2} = 0 \Rightarrow$$

$$\textcolor{red}{K} = \sum_k \frac{p_k^2}{m_k} = \sum_{i < j} m_i m_j,$$

$$\textcolor{red}{V}_0 = \sum_{i < j} m_i m_j \log r_{ij} = E - \frac{1}{2} \sum_{i < j} m_i m_j.$$