Perturbation equations in Hamiltonian form

$$\begin{aligned} \frac{dL_k}{dt} &= \frac{\partial \mathcal{H}}{\partial l_k}, \\ \frac{dl_k}{dt} &= -\frac{\partial \mathcal{H}}{\partial L_k}, \end{aligned} \qquad (\mathrm{k} = 1,2,3)$$

with the Hamiltonian

$$\mathcal{H} = \frac{æ^4}{2L_1^2} + R$$

and the *Delaunay variables*

$$\begin{aligned} L_1 &= æ\sqrt{a}, & l_1 &= M, \\ L_2 &= æ\sqrt{a(1-e^2)}, & l_2 &= \omega, \\ L_3 &= æ\sqrt{a(1-e^2)}\cos I, & l_3 &= \Omega \end{aligned}$$