Equation Sheet for Final

$$H(q,p) = \sum_j p_j \dot{q}_j - L$$

$$\frac{\partial H}{\partial p_i} = \dot{q}_i \qquad \frac{\partial H}{\partial q_i} = \dot{p}_i$$

$$a_I = \ddot{R} + a + 2\omega \times v + \omega \times (\omega \times r) + \dot{\omega} \times r$$

$$L = I\omega$$

$$I = \sum_i m_j \begin{pmatrix} S_{iy}^2 + S_{iz}^2 & & \\ & S_{ix}^2 + S_{iz}^2 & \\ & & S_{ix}^2 + S_{iy}^2 \end{pmatrix}$$

using principal axes

$$N_1 = I_1 \dot{\omega}_1 - \omega_2 \omega_3 (I_2 - I_3)$$

$$N_2 = I_2 \dot{\omega}_2 - \omega_3 \omega_1 (I_3 - I_1)$$

$$N_3 = I_3 \dot{\omega}_3 - \omega_1 \omega_2 (I_1 - I_2)$$