Classical Mechanics 2, Spring 2016 CMI
Problem set 10
Due by the beginning of lecture on Monday Mar 28, 2016
Rigid body

1. $\langle \mathbf{10} \rangle$ Consider a system whose phase space is $\mathbb{R}^3$ with coordinates L_1, L_2, L_3 satisfying the angular momentum Poisson brackets. There is no separation into generalized 'coordinates' and 'momenta' here. $\xi_i = L_i$ are the coordinates on phase space. This is relevant to the motion of a rigid body.

   (a) $\langle \mathbf{3} \rangle$ Write down the angular momentum Poisson brackets $\{L_i, L_j\} = \cdots$. Identify the Poisson tensor $r_{ij}(L)$ for the angular momentum Poisson brackets. (We aren't particular about placement of indices here, all indices are placed downstairs.)

   (b) $\langle \mathbf{7} \rangle$ Show that $L^2 = L_1^2 + L_2^2 + L_3^2$ is conserved under time evolution by *any* differentiable hamiltonian $H(L_1, L_2, L_3)$.