QUANTUM MECHANICS I

Physics 341 - Fall Quarter, 2010 - University of Chicago

PROBLEM SET #7 – DUE TUESDAY, NOVEMBER 16

This problem set will be worth 7 points, as we have some catching up to do after the Midquarter: Problems 3.1 (1 point), 3.2 (1 point), 3.3 (1 point), 3.5 (1 point), 3.6 (2 points), and 3.9 (1 points). all in Sakurai and Napolitano. Please note that the numbering is that of the *new* edition. The old edition does not contain Problem 3.2, so all subsequent numbers are changed.

For Problem 3.5, you will need the commutation relations of the components of the angular momentum **K** in the *body-fixed frame*. These may be shown to be $[K_i, K_j] = -i\hbar\epsilon_{ijk}K_k$. You are asked to do this by showing that the commutator $[\mathbf{J} \cdot \mathbf{a}, \mathbf{J} \cdot \mathbf{b}]$ is equal to $-i\hbar\mathbf{J} \cdot (\mathbf{a} \times \mathbf{b})$, where a and b are any two vectors (such as body principal axes) transforming under rotations. Such a discussion is contained, for example, in Landau and Lifshitz's *Quantum Mechanics: Non-relativistic Theory*.