Okayama University
Faculty of Science

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Exercises for Advanced Physics 1, 2019 term 3

Exercise Set 4

(Due date: Tuesday, November 12, 2019)

Exercise 7 (**Spin orbit coupling**) (10 points)

The operator for the spin-orbit interaction is given by

$$H_{SO} = \lambda \vec{L} \cdot \vec{S}$$

Calculate the following commutators and comment the meaning of your result:

(a) $\left[H_{SO}, \vec{L}\right]_-$

(b) $\left[H_{SO}, \vec{S}\right]_-$

(c) $\left[H_{SO}, \vec{L}^2\right]_-$

(d) $\left[H_{SO}, \vec{S}^2\right]_-$

(e) $\left[H_{SO}, \vec{J}^2\right]_-$ where $\vec{J} = \vec{L} + \vec{S}$.