

## Homework 2

Due Wednesday 27 January

1. 10.1.2, p. 251 from Shankar
2. 10.2.3, p. 260 from Shankar
3. 10.3.1, p. 277 from Shankar
4. Consider a system of two identical particles with spin  $\frac{1}{2}$  or spin 1. Single-particle states are labeled  $|m\rangle$  and two-particle states are labeled  $|m_a m_b\rangle$ .
  - a) In each case, construct all possible symmetric and antisymmetric states. Use the operators

$$S = \frac{1}{2}(1 + P_{12})$$

$$A = \frac{1}{2}(1 - P_{12})$$

- to construct the states.
- b) Show that the number of states in the symmetric Hilbert space is greater than the number of states in the antisymmetric Hilbert space and that the total Hilbert space (the sum of the two spaces) has the correct dimensionality. For this problem, don't worry that bosons and fermions are limited to one of the spaces—there is often more to a problem than just the spin aspect.