(1) Modern Quantum Mechanics, Problem 1.1

(2) Modern Quantum Mechanics, Problem 1.2

(3) Modern Quantum Mechanics, Problem 1.3

(4) Modern Quantum Mechanics, Problem 1.4

(5) Modern Quantum Mechanics, Problem 1.5

Note that for Problems 1.2 and 1.3, you need the definitions of the so-called Pauli Spin Matrices. We will make a lot of use of these later, mainly in Chapter Three and afterwards, but for now, all you need are the definitions, namely

\[
\sigma_x = \sigma_1 \equiv \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}
\]

\[
\sigma_y = \sigma_2 \equiv \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}
\]

\[
\sigma_z = \sigma_3 \equiv \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}
\]

\[
\sigma \equiv \sigma_x \hat{x} + \sigma_y \hat{y} + \sigma_z \hat{z} = \sum_k \sigma_k \hat{e}_i
\]