1 Spin-1/2 Time Dependence Practice

Two electrons are placed in a magnetic field in the z-direction. The initial state of the first electron is $\frac{1}{\sqrt{2}}\begin{pmatrix}1\\ i\end{pmatrix}$ and the initial state of the second electron is $\frac{1}{2}\begin{pmatrix}\sqrt{3}\\ 1\end{pmatrix}$.

(a) Find the probabilty of measuring each particle to have spin-up in the x-, y-, and z-directions at $t = 0$.

(b) Find the probabilty of measuring each particle to have spin-up in the x-, y-, and z-directions at some later time t.

(c) Calculate the expectation values for S_x, S_y, and S_z for each particle as functions of time.

(d) Are there any times when all the probabilities you have calculated are the same as they were at $t = 0$?