

Q2P2

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Due Friday by 2:15pm **Points** 50 **Submitting** a file upload **File Types** pdf

Available Mar 19 at 1:25pm - Mar 19 at 2:25pm about 1 hour

An electron is in a uniform magnetic field $\vec{B} = B\hat{e}_y$. Its Hamiltonian is $H = \frac{e\hbar B}{2m_e} \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$ in the basis where its spin operator S_z is represented by $\frac{\hbar}{2} \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$. At time $t = 0$, the electron is in the eigenstate of S_z with the eigenvalue $\frac{\hbar}{2}$. Show detailed steps for the parts below.

(a) Find the energy eigenvalues and eigenstates. (25 points)

(b) Find the spin state of the electron for $t > 0$. (25 points)